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CLASSIFICATION CHANGE

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FOREWORD

The test described herein was conducted under NASA Apollo contract NAS 9-150.

This report was prepared by R. Ufer of the Wind Tunnel Test Group, Space and Information Systems Division of North American Aviation, Inc.

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ABSTRACT

Stability of the launch escape system with longitudinal ribs on the command module determined for Mach numbers 0.7, 1.575, and 2.01 using the 0.02-scale force model in the NAA Supersonic Aerophysics Laboratory is defined. The model configuration and installation are described, and the operating conditions and instrumentation are specified. The six-component force and moment data are presented in tabular form.

Basic wind tunnel test data are presented only to make the test results available at the earliest possible date. Analyses and summary of results will be reported under separate cover.

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I. INTRODUCTION

Apollo force model FS-1 was tested in the SAL wind tunnel from 6 June 1962 to 8 June 1962. The test was conducted to determine the aerodynamic characteristics of the launch escape system with longitudinal ribs on the command module surface.

A total of 155 acceptable data points were taken at Mach numbers 0.7, 1.575, and 2.01.

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II. MODEL DESCRIPTION AND INSTRUMENTATION

The model tested was a 0.02-scale model of the Apollo launch escape system. (See Figure 1.) The configuration changes consisted of the number and location of the longitudinal ribs on the command module surface. Figure 2 shows the exact shape and location of the longitudinal ribs.

COMMAND MODULE

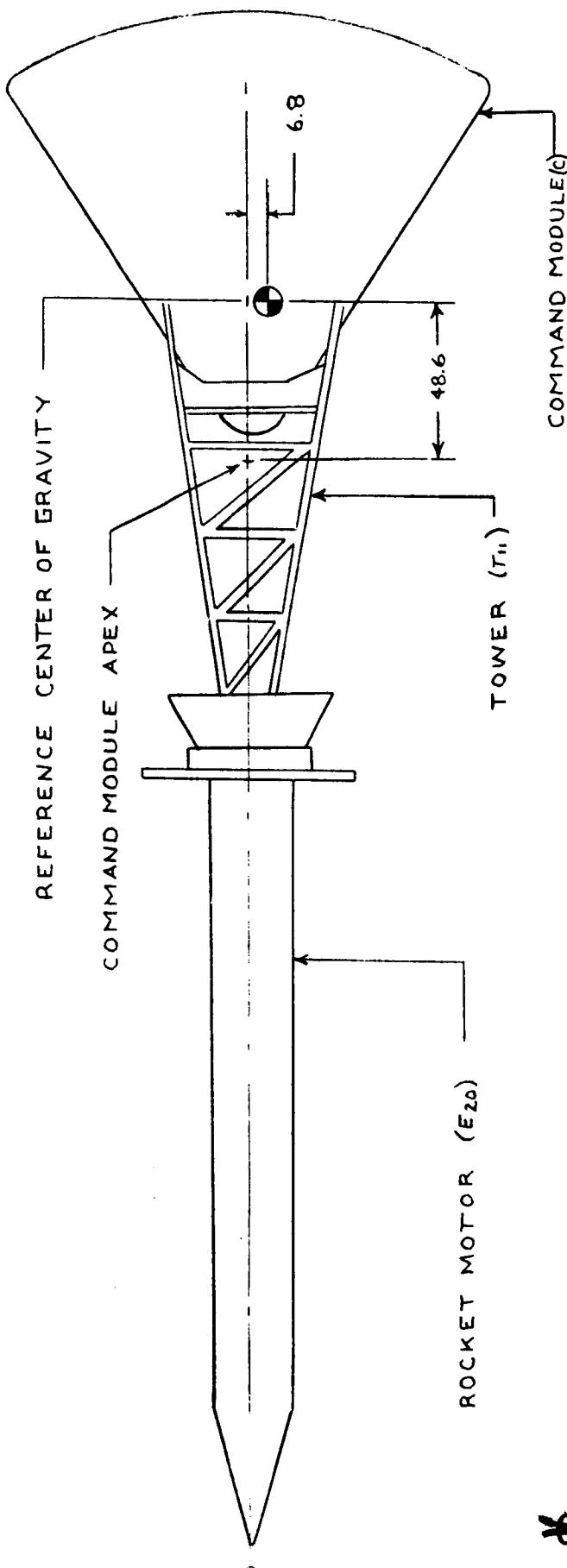
The model was tested through an angle-of-attack range of -10 to +50 degrees. To accomplish this, three command modules were used. Model No. 1, which has a sting cavity axis location at 0 degrees with respect to the command module center line, covers the angle-of-attack range from -10 to 30 degrees. Model No. 2, with the sting cavity axis at 20 degrees to the center line, covers the angle-of-attack range from 25 to 35 degrees. Model No. 3, with the sting cavity axis at 40 degrees to the command module center line, covers the 35- to 50- angle-of-attack range.

LAUNCH ESCAPE SYSTEM

The components that made up the launch escape system for this test included escape motors E₁₄ and E₂₀ and the tower structure T₁₁. (See Figures 3 and 4.)

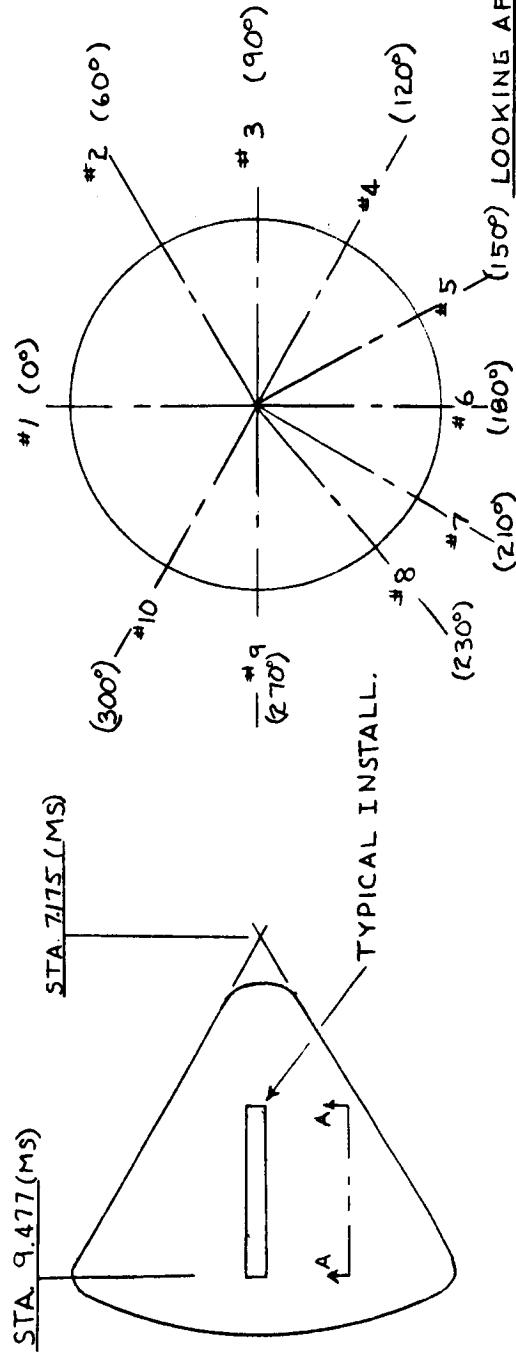
INSTRUMENTATION

The H-875 balance was used to obtain standard six-component force data. A model base pressure and a model chamber pressure were recorded. Schlieren photographs were taken at 5-degree intervals.

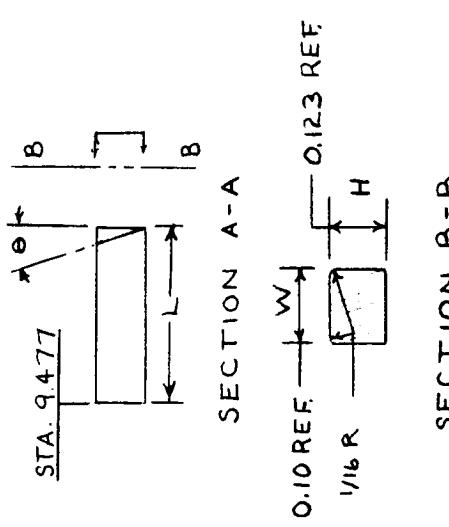
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FULL SCALE DIMENSIONS - INCHES
NOT TO ANY SCALE

FIGURE 1 - LAUNCH ESCAPE SYSTEM ($E_{20} T_1 C$)~~CONFIDENTIAL~~

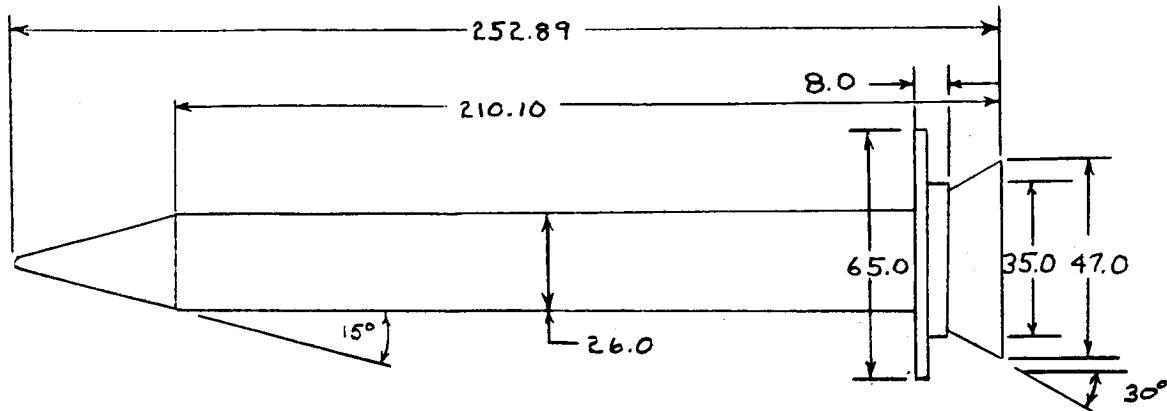
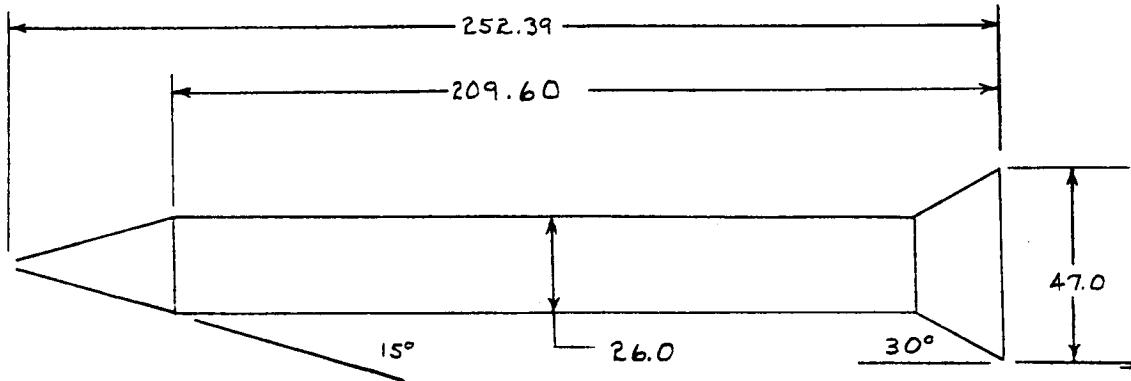
~~CONFIDENTIAL~~COMMAND MODULE, C, C₁₁, C₁₂, C₁₄

CONELIG.	DESCRIPTION AND LOCATION OF RIBS				STREAM-LINE ANGLE, Q (DEG)
	L	M	H	MERID. NO.	
C	—	—	—	—	0
C ₁₁	1.941	0.10	0.123	1, 3, 9	0
C ₁₂	1.930	0.10	0.123	6	0
C ₁₄	1.941	0.10	0.123	1, 3, 9	0
	1.930	0.10	0.123	6	0
	1.790	0.10	0.123	2, 4, 5, 7, 8, 10	0
	1.200	0.10	0.123	1, 3, 6, 9	36

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ALL DIMENSIONS IN INCHES, MODEL SCALE

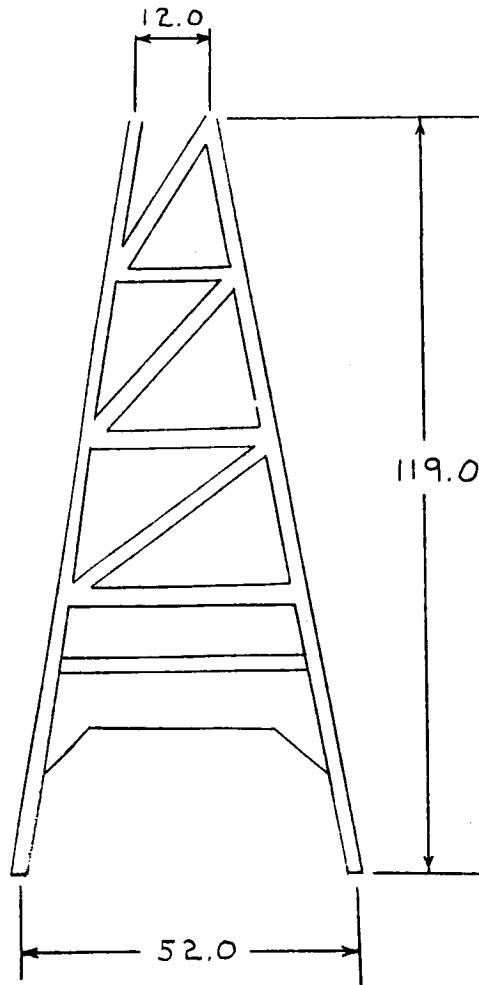
FIGURE 2 - COMMAND MODULE MODEL DESCRIPTION

~~CONFIDENTIAL~~T₂₀T₁₄

FULL SCALE DIMENSIONS - INCHES
NOT TO ANY SCALE

FIGURE 3 - LAUNCH ESCAPE SYSTEM, ESCAPE MOTORS

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TII

FULL SCALE DIMENSIONS - INCHES
NOT TO ANY SCALE

FIGURE 4 - TOWER STRUCTURE

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III. OPERATING CONDITIONS

MODEL ATTITUDES

The angle-of-attack range for the launch escape system was from -10 to 50 degrees.

The angles of attack covered in the minus 10- to plus 10-degree range were -10, -7, -5, -3, -2, -1, 0, 1, 2, 3, 5, 7, 10 degrees.

The angles of attack covered in the 10- to 30-degree range were 15, 20, 25, and 30 degrees.

The angles of attack covered in the 40-to 50-degree range were 35, 40, 45, and 50 degrees.

FLOW CONDITIONS

The following flow conditions are for tunnel clear operation:

Mach No.	Reynolds No. $\times 10^{-6}$ (Based on command module diameter)	Dynamic Pressure (lb/ft ²)
0.681	0.98	720
1.575	1.16	884
2.01	1.024	756

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IV. TEST PROGRAM

A summary of the runs completed are presented by number in the following tabulation.

Configuration	Mach No.											
	0.7				1.575				2.011			
	ANGLE OF ATTACK											
	-10 to +10	20	35	-3 to +10	-10 to +10	20	35	-3 to 10	-10 to 10	20	35	-3 to +10
E ₂₀ T ₁₁ C	53	54	55									
E ₂₀ T ₁₁ C ₁₁	56	57	58		61	60	59			72	71	73
E ₂₀ T ₁₁ C ₁₂					62	63	64			69	70	68
E ₂₀ T ₁₁ C ₁₄		75	76	74				66	65	67		
E ₁₄ T ₁₁ C ₁₂												

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V. DATA REDUCTION

DATA REDUCTION CONSTANTS

The following data reduction constants were used for the FS-1 test:

Reference Area = 7.4506 in.²

Reference Length = 3.0800 in.

Reference center of gravity location for the launch escape system:

\bar{x} = 0.7392 inches from the center of heat shield measured along the axis; at symmetry

\bar{z} = 0.1817 inches below the axis at symmetry.

SYMBOLS

C_L Lift coefficient = L/qS

C_N Normal force coefficient = N/qS

C_x Axial force coefficient, stability axes = C_D when $\psi = 0$

C_A Axial force coefficient, body axes = A/qS

C_D Drag coefficient = D/qS

C_m Pitching moment coefficient = m/qSd

C_n Yawing moment coefficient = n/qSd

C_ℓ Rolling moment coefficient = ℓ/qSd

L/D Lift-Drag ratio = C_L/C_D

$x_{cp/d}$ Center at pressure, measured from the center of the heat shield along the axis of symmetry = $(\bar{x}/d) + (C_{mc} g/C_N)$
 $-(C_a/C_N)(\bar{z}/d)$

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- q Dynamic pressure, psi
- S Reference area, in.²
- d Reference length, d
- \bar{x} Distance from the center of heat shield to the reference center at gravity, measured along the axis of symmetry
- \bar{z} Distance from the axis of symmetry to the reference center of gravity, measured normal to the axis of symmetry
- α Angle of attack, degrees
- ψ Angle of yaw, degrees

SUBSCRIPTS

- S Referenced to the stability axes system
- B Referenced to the body axes system

DATA REFERENCES

Tabulated data from this test are presented in Appendix A, and plotted data is presented in Appendix B. The discontinuities apparent in plots of C_D (Figures 5b, 7b, and 10b) and C_A (Figures 5d, 7d, and 10d) occur when command module model sting angles are changed. These discontinuities are due to sting interference that increase base pressure, which, in turn, decreases axial force and drag. This occurs when the sector is at a negative angle of attack.

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VI. REFERENCES

1. Cohen, M. H. Test and Model Information to Wind Tunnel Tests of an 0.02-Scale Force Model (FS-1) of the Apollo in the NAA Supersonic Aerophysics Laboratory; NAA Report NA-62-82, 25 Jan. 1962.

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SPACE and INFORMATION SYSTEMS DIVISION

APPENDIX "A"

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TABULATED DATA NOMENCLATURE

The key to reading the tabulated data is as follows:

First Row:

Alpha C = Angle of attack, degrees
CL = Lift coefficient
CX = Axial force coefficient,
about stability axis
CPM = Pitching moment coefficient,
about center of gravity
CYM Stab= Yawing moment coefficient,
about stability axis
CRM Stab= Rolling moment coefficient
about stability axis
DP/Q = Base pressure, body
L/D = Lift drag ratio

Second Row:

Yaw C = Angle of yaw, degrees
CN Body = Normal force coefficient,
about body axis
CA Body = Axial force coefficient
about body axis
CY Body = Side force coefficient,
about body axis
CM Body = Yawing moment coefficient,
about body axis
CRM Body = Rolling moment coefficient,
about body axis
CD = Drag coefficient
XCP/D = Center of pressure, measured
from the center of the heat
shield along the axis of symmetry

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT... (USE EDPM PROGRAMS 2K178+624) JOB NO. (3772-03)

SAL NO.	201	(X/D) = .61, THETA = 0	CONFIGURATION..(30)=E20 T11 C	(Z/D) = .044,	RUN NO. 53
TEST NO.	RUN.LOG	ALPHA C	CX	CPM	CYM.STAB CRM.STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN)BODY (CA)BODY	(CY)BODY	CRM.BODY CD (X CP/D)

1207	53.579	-•.003	.00402	.61176	.01744	.01126	-•.00063	0	.00657
681	2.000	-•.031	.00398	.61176	-.03116	.01126	-.00063	.61176	-0
0	•580	-1.058	-•.07933	.65212	-.05301	.00511	.00017	0	-.12166
2.000	-•.012	-•.09136	.65054	-.01252	.00510	.00026	.65212	-.34314	
•581	-3.108	-•.12656	.72160	.07246	.00141	.00078	0	-.17539	
3.000	-•.002	-•.16549	.71368	-.00220	.00137	.00085	.72160	-.36189	
•582	-2.083	-•.10269	.69227	.06303	.00193	.00078	0	-.14834	
3.000	-•.003	-•.12778	.68808	-.00383	.00190	.00085	.69227	-.35363	
0	•583	-5.160	-•.17318	.76716	.08960	-.00092	.00153	0	-.22574
0	2.000	.005	-•.24146	.74848	.00425	-.00106	.00144	.76716	-.37533
0	•584	-7.202	-•.19932	.80620	.09729	-.00116	.00168	0	-.24724
0	2.000	.006	-•.29881	.77486	.00529	-.00136	.00152	.80620	-.39851
0	•585	-10.226	-•.16789	.85860	.08727	-.00104	.00197	0	-.19554
0	2.000	.009	-•.31762	.81517	.00762	-.00137	.00175	.85860	-.44815

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(30)=E20 T11 C	(Z/D)=.044,	RUN NO. 53				
TEST NO.	RUN.LOG	ALPHA C	C L	C X	CPM	CYM-STAB	CRM-STAB	(DP/Q)B	(L/D)
MACH NO.	REIT	YAW C	(CN) BODY	(CA) BODY	(CY) BODY	CYM.BODY	CRM.BODY	CD	(X CP/D)
1207	53.586	1.051	.08307	.64965	-.01150	.00579	.00014	0	.12788
681	2.000	-.012	.09497	.64801	-.01311	.00579	.00004	.64965	-.18874
0	.587	2.080	.11594	.69583	-.02359	.00345	.00046	0	.16663
0	3.000	-.006	.14111	.69117	-.00710	.00346	.00034	.69583	-.22732
0	.588	3.105	.14104	.73275	-.03225	.00296	.00062	0	.19248
0	3.000	-.004	.18052	.72404	-.00510	.00299	.00046	.73275	-.25484
0	.589	5.155	.18211	.78609	-.04424	.00218	.00076	0	.23166
0	3.000	-.003	.25198	.76655	-.00405	.00224	.00056	.78609	-.30057
0	.590	7.193	.19941	.82667	-.04562	.00156	.00093	0	.24122
0	3.000	-.003	.30133	.79520	-.00319	.00167	.00073	.82667	-.34251
0	.591	10.227	.18374	.88595	-.03788	.00059	.00099	0	.20739
0	3.000	-.001	.33809	.83926	-.00122	.00076	.00087	.88595	-.38873

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO. (3772-03)

SAL NO.	201	(X/D)=.61, THETA=	20	CONFIGURATION..(30)=E20 TII C	(Z/D)=.044,	RUN NO. 54
TEST NO.	RUN.LOG	ALPHA C	CL	CX	CPM	CYM-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN)BODY	(CA)BODY	(CY)BODY	CYM.BODY CRM.BODY CD (X CP/D)
1207	54.592	20.170	.17882	.92463	-.03392	.00541 -.00048 0 .19339
681	2.000	.005	.48661	.80631	-.00039	.00491 -.00231 .92463 -.46739
0	.593	15.095	.17158	.94505	-.03590	.00390 .00036 0 .18156
0	3.000	.011	.41173	.86778	.00549	.00386 -.00067 .94505 -.43008
0	.595	25.277	.21125	.90509	-.00656	-.00136 -.00633 0 .23340
0	2.000	-.022	.57744	.72828	-.01504	-.00394 -.00514 .90509 -.54315
0	.597	30.388	.24382	.90710	.02708	-.01309 -.01942 0 .26879
0	2.000	-.069	.66911	.65921	-.03955	-.02111 -.01013 .90710 -.60712

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NAA SISD SUPERSONIC AERG LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 40	CONFIGURATION..(30)=E20 T11 C	(Z/D)=.044,	RUN NO. 55
TEST NO.	RUN.LOG	ALPHA C	CY	CPM	CYM-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO.	RELT	YAW C	(CN)BODY	(CA)BODY	CYM.BODY CRM.BODY CD (X CP/D)
1207	55.599	40.463	.31730	.97562	.13832 .00502 -.00671 0 .32523
681	2.000	-.018	.87448	.53648	-.01868 -.00053 -.00837 .97562 -.74118
0	.600	35.310	.26515	.96503	.07142 -.02210 -.03773 0 .27476
0	1.000	-.083	.77408	.63433	-.05161 -.03984 -.01802 .96503 -.66620
0	.601	45.611	.37053	.97058	.20409 -.00342 -.01804 0 .38176
0	2.000	-.034	.95271	.41431	-.02314 -.01528 -.01018 .97058 -.80509
0	.602	50.710	.36148	1.00073	.26459 -.01457 -.03549 0 .36121
0	1.000	-.053	1.00337	.35410	-.02640 -.03669 -.01121 1.00073 -.85817

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT.. (USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(46)=E20 T11 C11 (Z/D)=.044	RUN NO. 56
TEST NO.	RUN.LOG	ALPHA C CL	CX CPM	CYM-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C (CN)BODY	(CY)BODY	CYM-BODY CRM-BODY CD (X CP/D)
1207	56.603	-.005 .00141	.60366 .01719	.00982 -.00068 0 .00233
681	3.000	-.031 .00135	.60366 -.03012	.00982 -.00068 .60366 -0
0	.604	-1.060 -.07934	.63886 .05006	.00351 -.00041 0 -.12419
0	2.000	-.009 -.09114	.63729 -.00934	.00351 -.00047 .63886 -.36838
0	.605	-2.091 -.11594	.68382 .06564	.00112 .00135 0 -.16955
0	3.000	-.002 -.14081	.67913 -.00193	.00107 .00139 .68382 -.35603
0	.606	-3.121 -.14562	.72144 .07658	-.00042 .00182 0 -.20184
0	2.000	.002 -.18467	.71244 .00221	-.00052 .00180 .72144 -.36504
0	.607	-5.180 -.19998	.77623 .09338	-.00205 .00243 0 -.25763
0	2.000	.007 -.26923	.75501 .00705	-.00226 .00224 .77623 -.38656
0	.608	-7.218 -.21153	.82234 .09111	-.00130 .00235 0 -.25723
0	2.000	.007 -.31316	.78925 .00672	-.00159 .00217 .82234 -.42997
0	.609	-10.248 -.19124	.87497 .08587	-.00046 .00243 0 -.21857
0	2.000	.008 -.34383	.82699 .00674	-.00088 .00231 .87497 -.46608

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(46)=E20 T11 C11	(Z/D)=.044	RUN NO. 56
TEST NO.	RUN.LOG	ALPHA C	CX	CPM	CYM-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO.	RELT	YAW C	(CN)BODY	(CY)BODY	CYM.BODY CRM.BODY CD (X CP/D)
1207	56.610	10.248	.20347	.90283	-.03480 .00116 .00071 0 -.22537
681	3.000	-.004	.36081	.85224	-.00403 .00127 .00049 .90283 -.40961
0	.611	7.218	.22640	.85374	-.04433 .00239 .00055 0 -.26519
0	3.000	-.007	.33186	.81853	-.00673 .00244 .00024 .85374 -.36790
0	.612	5.178	.21200	.79504	-.04683 .00370 .00070 0 .26666
-	2.000	-.009	.28287	.77267	-.00939 .00375 .00036 .79504 -.32428
0	.613	3.118	.15705	.73190	-.03322 .00449 .00050 0 .21457
0	2.000	-.009	.19661	.72228	-.01021 .00452 .00025 .73190 -.27942
0	.614	2.087	.12384	.69514	-.02285 .00416 .00045 0 .17815
0	2.000	-.010	.14906	.69017	-.01044 .00418 .00030 .69514 -.25296
0	.615	1.053	.08462	.64862	-.00990 .00575 .00021 0 .13046
0	2.000	-.016	.09653	.64695	-.01656 .00575 .00010 .64862 -.21257

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO. 201 (X/D)=.61, THETA=20 CONFIGURATION..(46)=E20 T11 C11 (Z/D)=.044 RUN NO. 57

TEST NO. RUN.LOG ALPHA C CL CX CPM CYM-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO. REIT YAW C (CN)BODY (CA)BODY (CY)BODY CRM.BODY CD (X CP/D)

1207	57.616	20.215	.23047	.94837	-.03191	.00355	-.00073	0	.24302
681	2.000	.004	.54392	.81035	.00059	.00308	-.00191	.94837	-.48578
0	.617	15.119	.19872	.97565	-.03336	.00380	.00114	0	.20368
0	2.000	.014	.44626	.89007	.00741	.00397	.00011	.97565	-.44750
0	.618	25.331	.27515	.94879	-.01180	-.00282	-.00813	0	.29000
0	2.000	-.028	.65457	.73990	-.01872	-.00603	-.00615	.94879	-.54224
0	.619	30.445	.30641	.98483	.01483	-.00788	-.01402	0	.31113
0	2.000	-.048	.76311	.69386	-.02869	-.01390	-.00810	.98483	-.58943

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 40	CONFIGURATION..(46)=E20 T11 C11 (2/D)=.044	RUN NO. 58
TEST NO.	RUN.LOG	ALPHA C CL CX CPM CYM-STAB (DP/Q)B (L/D)	CYM-STAB CRM-STAB (DP/Q)B (L/D)	
MACH NO.	REIT	YAW C (CN)BODY (CA)BODY (CY)BODY CRM-BODY CD (X CP/D)	CYM-BODY CRM-BODY CD (X CP/D)	
1207	58.620	.40.496 .35489 1.09821 .11899 .01110 .00153 0 .32315		
681	2.000	-.002 .98296 .60481 -.00731 .00943 -.00604 1.09821 -.70398		
0	-621	35.352 .32852 1.06860 .05066 -.01370 -.02399 0 .30743		
0	1.000	-.045 .88616 .68158 -.02755 -.02505 -.01164 1.06860 -.63332		
0	-622	45.584 .30602 1.16621 .18136 -.00629 -.00523 0 .26241		
0	2.000	.020 1.04708 .59776 .02102 -.00814 .00083 1.16621 -.75809		
0	-623	50.627 .19512 1.23132 .23663 -.01186 -.02431 0 .15847		
0	2.000	-.020 1.07552 .63045 -.00445 -.02631 -.00626 1.23132 -.80422		
0	-624	50.623 .19104 1.21922 .24088 -.00750 -.01999 0 .15669		
0	2.000	-.019 1.06355 .62600 -.00710 -.02021 -.00689 1.21922 -.81059		

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 40	CONFIGURATION..(46)=E20 T11 C11	(Z/D)=.044	RUN NO. 59
TEST NO.	RUN.LOG	ALPHA C CL	CX CPM	CYM-STAB CRM-STAB (DP/Q)B	(L/D)
MACH NO.	REIT	YAW C (CN)BODY	(CA)BODY (CY)BODY	CYM.BODY CRM.BODY CD	(X CP/D)
1207	59.627	40.870 .28504	1.20147 .15803	.01021 -.00361	0 .23724
1575	3.000	-.021 1.00163	.72215 -.01742	.00536 -.00941	1.20147 -.73605
0	.628	35.736 .34897	1.12290 .10100	.00614 -.00304	0 .31077
0	2.000	-.001 .93901	.70777 -.00554	.00321 -.00605	1.12290 -.68440
0	.629	46.030 .22607	1.28838 .21323	.00467 -.00308	0 .17547
0	2.000	-.003 1.08410	.73195 -.00247	.00103 -.00550	1.28838 -.77698
0	.630	51.155 .15485	1.35446 .24638	.00471 -.00348	0 .11433
0	2.000	-.001 1.15192	.72912 -.00275	.00024 -.00585	1.35446 -.79604

NAA SISD SUPersonic AERO LABORATORY TEST DATA PRINTOUT... (USE EDPM PROGRAMS 2K178+624) JOB NO. (3772-03)

SAL NO.	201	(X/D)=.61,	THETA= 20	CONFIGURATION..(46)=E20 T11 C11	(Z/D)=.044	RUN NG.	60
TEST NO.	RUN LOG	ALPHA C	CL	CX	CPM	CYN. STAB	(DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN) BODY	(CA) BODY	(CY) BODY	CRM. BODY	(X CP/D)
1207	60.631	20.507	.28472	.95706	-.00243	.01090	.00076 0 .29749
1575	2.000	.018	.60190	.79671	-.00052	.01048	-.00310 .95706 -.54772
0	.632	15.269	.23933	.91644	-.04008	.00658	-.00097 0 .26115
0	3.000	-.003	.47219	.82108	-.00377	.00609	-.00266 .91644 -.44861
0	.633	25.728	.32348	1.02162	.02031	.00824	-.00037 0 .31664
0	2.000	-.008	.73482	.77998	-.00322	.00727	-.00391 1.02162 -.59093
0	.634	30.938	.32810	1.16113	.04407	.00348	-.00443 0 .28257
0	3.000	-.015	.87829	.82733	-.00869	.00071	-.00559 1.16113 -.61874

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) J08 NO. (3772-03)
SAL NO. 201 (X/D)=.61, THETA= 0 CONFIGURATION..(46)=E20 T11 C11 (Z/D)=.044 RUN NO. 61

TEST NO.	RUN LOG	ALPHA C	CL	CX	CPM	CYM-STAB	CRM-STAB	(DP/Q)B	(L/D)
MACH NO.	RELT	YAW C	(CN)BODY	(CA)BODY	(CY)BODY	CYM-BODY	CRM-BODY	CD	(X CP/D)
1207	61.636	.007	-0.01891	.75579	.01585	.00938	.00015	0	.02502
1575	2.000	-0	-0.01900	.75579	-.00716	.00938	.00015	.75579	-0
0	.637	-1.042	-0.02333	.76085	.04332	.00488	.00119	0	-.03067
0	2.000	-0.002	-0.03717	.76030	-.00282	.00486	.00128	.76085	-.34462
0	.638	-2.091	-0.05715	.79026	.06321	.00599	.00150	0	-.07232
0	2.000	-.003	-0.08595	.78765	-.00336	.00593	.00171	.79026	-.27778
0	.639	-3.137	-0.08515	.81840	.07937	.00403	.00127	0	-.10405
0	2.000	.009	-0.12981	.81251	.00071	.00396	.00149	.81840	-.27395
0	.640	-5.222	-0.12897	.87873	.10682	.00208	.00162	0	-.14677
0	2.000	.013	-0.20840	.86334	-.00403	.00193	.00180	.87873	-.27971
0	.641	-7.295	-0.15426	.93267	.12480	.00098	.00188	0	-.16539
0	2.000	.018	-0.27141	.90555	.00715	.00073	.00199	.93267	-.29697
0	.643	-10.405	-0.17420	.99893	.13528	.00023	.00212	0	-.17438
0	2.000	.021	-0.35170	.95106	.00909	-.00015	.00213	.99893	-.35003

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(46)=E20 T11 C11 (Z/D)=.044	RUN NO. 61
TEST NO.	RUN LOG	ALPHA C CL CX CPM CYM. STAB CRM. STAB (DP/Q)B (L/D)		
MACH NO.	REIT	YAW C (CN) BODY (CA) BODY (CY) BODY CRM.BODY CD (X CP/D)		
1207	61.644	1.057 .06143 .77574 -.01066 .01005 .00068 0 .07919		
1575	2.000	-.002 .07573 .77447 -.00846 .01006 .00050 .77574 -.01921		
0	.645	2.100 .08720 .80018 -.02381 .00718 .00088 0 .10898		
0	2.000	-.007 .11646 .79644 -.00850 .00720 .00061 .80018 -.10470		
0	.646	3.149 .11403 .83074 -.03497 .00836 .00065 0 .13726		
0	2.000	-.002 .15948 .82323 -.00737 .00838 .00019 .83074 -.16356		
0	.647	5.224 .14676 .89285 -.05290 .00730 .00100 0 .16438		
0	2.000	-0 .22744 .87578 -.00573 .00736 .00033 .89285 -.20800		
0	.648	7.306 .17891 .94958 -.06980 .00364 .00145 0 .18841		
0	2.000	-.001 .29819 .91913 -.00247 .00380 .00098 .94958 -.24031		
0	.650	10.418 .19535 1.02795 -.07182 .00376 .00140 0 .19003		
0	3.000	-.005 .37797 .97570 -.00491 .00395 .00070 1.02795 -.30640		

NAA SJSD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO. (37772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(45)=E20 T11 C12 (L/D)=.044	RUN NO. 62
TEST NO.	RUN.LOG	ALPHA C CL	CX CPM CYM-STAB CRM-STAB (DP/Q)B (L/D)	
MACH NO.	REIT	YAW C ICN)BODY (CA)BODY (CY)BODY CRM.BODY CD (X CP/D)		
1207	62.651	.008 .01882	.01642 .01023 .00069 0	.02494
1575	2.000	-.005 .01892	.75474 -.00995 .01023 .00068 .75474 -0	
0	.652	-1.049 -.02946	.76078 .04558 .00449 .00104 0	-.03872
0	2.000	-.001 -.04338	.76012 -.00298 .00447 .00112 .76078 -.33019	
0	.653	-2.103 -.06704	.78849 .06593 .00529 .00088 0	-.08503
2.000	-.002	-.09592 .78550	-.00328 .00525 .00108 .78849 -.28302	
0	.654	-3.153 -.09922	.81751 .08341 .00333 .00106 0	-.12136
0	2.000	.009 -.14403	.81081 .00127 .00326 .00124 .81751 -.27854	
0	.655	-5.249 -.15341	.87543 .11385 .00162 .00128 0	-.17524
0	2.000	.012 -.23284	.85773 .00394 .00150 .00142 .87543 -.28312	
0	.656	-7.331 -.18536	.93407 .13281 .00083 .00178 0	-.19845
0	2.000	.018 -.30302	.90279 .00695 .00060 .00187 .93407 -.30279	
0	.657	-10.452 -.21074	1.02032 .14396 .00013 .00223 0	-.20655
0	2.000	.022 -.39231	.96517 .00947 -.00027 .00221 1.02032 -.35129	

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO. (3772-03)

SAL NO.	201	(X/D)=.61,	THETA= 0	CONFIGURATION..(45)=E20 T11 C12 (Z/D)=.044	RUN NO. 62
TEST NO.	RUN LOG	ALPHA C	CL	CPH	CYH-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN)BODY	(CA)BODY	(CY)BODY CRM-BODY CD (X CP/D)
1207	62.658	1.062	.06300	.77564	-.00901 .00958 .00132 0 .08123
1575	2.000	-.003	.07736	.77434	-.00859 .00961 .00114 .77564 -.05317
0	.659	2.110	.09348	.79931	-.02336 .00676 .00096 0 .11695
0	2.000	-.005	.12284	.79533	-.00732 .00680 .00071 .79931 -.13493
0	.660	3.163	.12487	.82693	-.03629 .00785 .00105 0 .15101
0	2.000	-.003	.17030	.81878	-.00741 .00790 .00062 .82693 -.18537
0	.661	5.247	.16348	.88859	-.05481 .00725 .00137 0 .18398
0	2.000	-.004	.24404	.86992	-.00709 .00734 .00071 .88859 -.22855
0	.662	7.334	.19899	.94885	-.07154 .00392 .00143 0 .20971
0	2.000	-.002	.31846	.91570	-.00405 .00407 .00092 .94885 -.25882
0	.663	10.451	.21687	1.03109	-.07211 .00318 .00156 0 .21033
0	3.000	-.006	.40026	.97466	-.00512 .00341 .00096 1.03109 -.32270

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(IUSE EDPM PROGRAMS 2K178+624) J08 NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 20	CONFIGURATION..(45)=E20 T11 C12 (Z/D)=.044	RUN NO. 63	
TEST NO.	RUN.LOG	ALPHA C	CX	CPM	CYM-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C (CN)BODY	(CA)BODY	(CY)BODY	CYM.BODY CRM.BODY CD (X CP/D)
1207	63.667	20.551	.31937	.97721	-.01015 .00667 -.00492 0 .32682
1575	2.000	-.027	.64204	.80295	-.01692 .00452 -.00695 .97721 -.53917
0	.668	15.322	.27704	.89076	-.04392 .00966 -.00112 0 .31101
0	3.000	-.007	.50253	.78591	-.00449 .00902 -.00363 .89076 -.45378
0	.669	25.721	.29581	1.16201	.02040 .00989 -.00070 0 .25456
0	2.000	-.003	.77072	.91856	-.00632 .00861 -.00493 1.16201 -.58403
0	.670	30.947	.30861	1.25537	.04484 .00446 -.00392 0 .24583
0	2.000	-.022	.91015	.91805	-.01229 .00181 -.00566 1.25537 -.61489

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61,	THETA= 40	CONFIGURATION..(45)=E20	R11 C12	(Z/D)=.044	RUN NO. 64
TEST NO.	RUN.LOG	ALPHA C	CL	CX	CPM	CRM-STAB	(DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN)BODY	(CA)BODY	(CY)BODY	CRM.BODY	CD (X CP/D)
1207	64.671	40.945	.33544	1.19454	.16103	.00592	-.00386 0 .28081
1575	2.000	-.004	1.03611	.68260	-.00644	.00195	-.00680 1.19454 -.73643
0	.672	35.781	.37876	1.12622	.10143	.00728	-.00806 0 .33631
0	2.000	-.038	.96567	.69232	-.02349	.00120	-.01080 1.12622 -.68349
0	.673	46.088	.26694	1.25940	.22181	.00592	-.00534 0 .21196
0	3.000	-.013	1.09231	.68133	-.01015	.00026	-.00797 1.25940 -.78562

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61,	THETA= 40	CONFIGURATION..(47)=E14 T11 C12 (Z/D)=.044	RUN NO. 65
TEST NO.	RUN.LOG	ALPHA C	CL	CPM CYN-STAB CRM-STAB (DP/Q)B (L/D)	
MACH NO.	REIT	YAW C	(CN)BODY (CA)BODY	(CY)BODY CRM.BODY CD (X CP/D)	
1207	65.678	30.705	.43661	.95759 .08482 .00646 -.00505 0 .45595	
1575	3.000	-.015	.86430	.60050 -.01248 .00298 -.00764 .95759 -.67757	
0	.679	35.941	.47432	1.06510 .12465 .00815 -.00315 0 .44533	
0	2.000	-.006	1.00911	.58405 -.00928 .00475 -.00733 1.06510 -.70806	
0	.680	41.114	.43347	1.16308 .19055 .00774 -.00341 0 .37269	
0	2.000	-.009	1.09129	.59137 -.01033 .00359 -.00766 1.16308 -.76076	
0	0				
0	.681	46.233	.35737	1.23461 .24440 .00676 -.00535 0 .28946	
0	3.000	-.018	1.13870	.59610 -.01294 .00081 -.00858 1.23461 -.80160	

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S1062-1062

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 20	CONFIGURATION..(47)=E14 T11 C12 (Z/D)=.044	RUN NO. 66
TEST NO.	RUN.LOG	ALPHA C	CX	CPM
MACH NO.	REIT	YAW C (CN) BODY	(CA) BODY	CYM-STAB CRM-STAB (DP/Q)B (L/D)
			CYM-BODY CRM-BODY CD	(X CP/D)
1207	66.682	20.497 .26380	.91905 .01897	.00813 -.00253 0 .28704
1575	2.000	-.012 .56886	.76853 -.01129	.00673 -.00522 .91905 -.58390
0	.683	15.316 .24212	.81180 -.00804	.00617 -.00017 0 .29825
0	2.000	.013 .44791	.71904 .00080	.00591 -.00179 .81180 -.52141
0	.684	25.693 .26335	1.08442 .05252	.00780 -.00357 0 .24285
0	2.000	-.031 .70739	.86309 -.01930	.00548 -.00660 1.08442 -.63056
0	.686	30.960 .30998	1.16277 .08344	.00799 -.00200 0 .26658
0	2.000	-.007 .86391	.83773 -.00895	.00583 -.00582 1.16277 -.66391

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(47)=E14 T11 C12 (Z/D)=.044	RUN NO. 67
TEST NO.	RUN.LOG	ALPHA C CL	CX CPM CYM-STAB CRM-STAB (DP/Q)B (L/D)	
MACH NO.	REIT	YAW C (CN)BODY (CA)BODY	(CY)BODY CRM-BODY CRM-BODY CD (X CP/D)	
1207	67.687	.005 .01344	.80955 .02295 -.00157 .00099	0 .01660
1575	2.000	.012 .01350	.80955 .00603 -.00157 .00099	.80955 -0
0	.688	-3.128 -.06315	.82132 .06065 -.00300 .00200	0 -.07689
0	2.000	.017 -.10786	.81666 .00935 -.00310 .00183	.82132 -.38082
0	.689	1.047 .03542	.81050 .01312 -.00237 .00088	0 .04370
0	3.000	.012 .05022	.80971 .00689 -.00235 .00092	.81050 -.16173
0	.690	2.092 .06178	.81616 .00047 -.00039 .00050	0 .07570
0	2.000	.008 .09153	.81336 .00345 -.00037 .00051	.81616 -.22417
0	.691	3.143 .09360	.82536 -.01472 .00149 .00040	0 .11341
0	2.000	.003 .13870	.81899 -.00005 .00151 .00032	.82536 -.24405
0	.692	5.235 .14238	.86845 -.03677 .00182 .00058	0 .16395
0	2.000	.003 .22102	.85184 -.00009 .00187 .00041	.86845 -.27406
0	.693	7.321 .17480	.90362 -.04682 .00161 .00094	0 .19344
0	3.000	-.001 .28850	.87399 -.00106 .00171 .00073	.90362 -.31440

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(47)=E14 T11 C12 (Z/D)=.044	RUN NO. 67
TEST NO.	RUN.LOG	ALPHA C	CX	CPM
MACH NO.	REIT	YAW C (CN)BODY	(CA)BODY	CYM.BODY
1207	67.694	10.438	.19186 .96879 -.04048	.00195 .00099 0
1575	3.000	-.005	.36417 .91802 -.00386	.000209 .00063 .96879 -.38792

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(37772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(45)=E20 T11 C12 (Z/D)=.044	RUN NO. 68		
TEST NO.	RUN.LOG	ALPHA C	CX	CPM	CYM.STAB CRM.STAB (DP/Q)B (L/D)	
MACH NO.	REIT	YAH C	(CN)BODY	(CA)BODY	(CY)BODY	CYM.BODY CRM.BODY CD (X CP/D)
1207	68.695	.001	.00970	.65230	.01807	.00809 .00079 0 .01487
2040	2.000	-.012	.00972	.65230	-.01218	.00809 .00079 .65230 -0
0	696	-3.132	-.11791	.70528	.08769	.00468 .00087 0 -.16718
0	3.000	-.008	-.15626	.69778	-.00737	.00462 .00113 .70528 -.24532
0	697	1.045	.05077	.65770	-.00250	.00773 .00061 0 .07720
0	3.000	-.013	.06276	.65667	-.01224	.00774 .00047 .65770 -.10971
0	698	2.090	.09353	.67898	-.02407	.00717 .00077 0 .13775
0	3.000	-.013	.11822	.67512	-.01204	.00720 .00051 .67898 -.15513
0	699	3.131	.12899	.70989	-.04136	.00763 .00080 0 .18170
0	3.000	-.014	.16756	.70179	-.01286	.00767 .00038 .70989 -.17886
0	700	5.204	.17764	.77075	-.06218	.00724 .00113 0 .23048
0	3.000	-.014	.24681	.75147	-.01248	.00731 .00046 .77075 -.22410
0	701	7.275	.21300	.84132	-.07437	.00693 .00142 0 .25317
0	3.000	-.015	.31781	.80758	-.01281	.00705 .00053 .84132 -.26419

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SID 62-1063

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(45)=E20 T11 C12 (Z/D)=.044	RUN NO. 68
TEST NO.	RUN.LOG	ALPHA C	CL	CX CPM CRM-STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN) BODY	(CA) BODY (CY) BODY CRM.BODY CD (X CP/D)
1207	68.702	10.379	.24136	.93429 -.07428 .00555 .00158 0 .25834
2040	2.000	-.017	.40570	.87554 -.01316 .00574 .00056 .93429 -.33195

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 20	CONFIGURATION..(45)=E20 T11 C12 (Z/D)=.044	RUN NO. 69
TEST NO.	RUN LOG	ALPHA C CL	CX CPM CRM-STAB (DP/Q)B (L/D)	
MACH NO.	REIT	YAW C (CN) BODY (CA) BODY (CY) BODY	CYM.BODY CRM.BODY CD (X CP/D)	
1207	69.703	20.418 .29832 1.10419 .00124 .00468 -.00435 0 .27017		
2040	2.000	-.017 .66473 .93079 -.01241 .00287 -.00571 1.10419 -.55026		
0	.704	15.237 .26579 1.01635 -.02431 .00787 -.00092 0 .26151		
0	3.000	-.004 .52351 .91080 -.00397 .00735 -.00296 1.01635 -.48701		
0	.705	10.100 .25167 .91320 -.04861 .00624 -.00086 0 .27559		
0	2.000	-.005 .40788 .85492 -.00217 .00600 -.00195 .91320 -.39860		
0	.706	25.623 .33606 1.21132 .02539 .00903 -.00196 0 .27743		
0	2.000	-.006 .82676 .94694 -.00997 .00729 -.00567 1.21132 -.59032		
0	.707	30.786 .31718 1.31196 .05972 .01075 -.00008 0 .24176		
0	2.000	-.001 .94389 .96484 -.00785 .00920 -.00557 1.31196 -.62830		

SID 62-1063

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO. (3772-04)
 SAL NO. 201 (X/D)=.61 THETA= 40 CONFIGURATION..(45)=E20 T11 C12 (Z/D)=.044 RUN NO. 70
 TEST NO. RUN.LOG ALPHA C CL CX CPM CYM.STAB CRM.STAB (DP/Q)B (L/D)
 REIT YAW C (CN)BODY (CA)BODY (CY)BODY CYM.BODY CRM.BODY CD (X CP/D)
 MACH NO.

1207	70.708	40.667	.23072	1.45325	.12725	.00861	-.00249	0	.15876
2040	2.000	-.005	1.12190	.95210	-.00952	.00491	-.00750	1.45325	-.68608
0	.709	35.534	.29542	1.39843	.07120	.00802	-.00163	0	.21125
0	3.000	-.002	1.05303	.96644	-.00549	.00558	-.00598	1.39843	-.63723
	.710	45.782	.14504	1.49112	.18464	.00767	-.00250	0	.09727
2.000	-.006	1.16967	.93613	-.00939	.00356	-.00724	1.49112	-.73264	
	.711	50.880	.05443	1.49338	.23899	.00793	-.00227	0	.03645
	3.000	-.007	1.19280	.90020	-.00994	.00325	-.00759	1.49338	-.77716

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S1062-1063

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61,	THETA= 40	CONFIGURATION..(46)=E20 T11 C11	(Z/D)=.044	RUN NO. 71
TEST NO.	RUN LOG	ALPHA C	CL	CX	CPH	CYM-STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN) BODY	(CA) BODY	(CY) BODY	CYM-BODY CRM-BODY CD (X CP/D)
1207	71.712	40.637	.21051	1.45881	.12076	.00764 -.00206 0 .14430
2040	2.000	-.003	1.10969	.97007	-.00750	.00445 -.00654 1.45881 -.68036
0	.713	35.505	.27345	1.39951	.06928	.00760 -.00102 0 .19539
0	4.000	-.005	1.03530	.98060	-.00340	.00559 -.00524 1.39951 -.63524
0	.714	45.750	.12119	1.48860	.18169	.00731 -.00201 0 .08141
0	2.000	-.004	1.15070	.95210	-.00770	.00366 -.00664 1.48860 -.73149
0	.715	50.853	.03264	1.50103	.23305	.00707 -.00132 0 .02174
0	2.000	-.003	1.18454	.92252	-.00681	.00344 -.00631 1.50103 -.71247

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K118+044, JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61,	THETA= 20	CONFIGURATION..(46)=E20 F11 C11	(Z/D)=.044	RUN NO. 72
TEST NO.	RUN-LGC	ALPHA C	CL	CX	CPM	CYM-STAB CRM-STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C	(CN) BODY	(CA) BODY	(CY) BODY	CYM.BODY CRM.BODY CD (X CP/D)
1207	72.716	20.378	.26866	1.09976	-.03166	.00364 -.00375 0 .24429
2040	2.000	-.017	.63473	.93743	-.01153	.00210 -.00478 1.09976 -.49513
0	.717	15.204	.23944	1.00918	-.05378	.00452 -.00202 0 .23726
0	3.000	-.006	.49568	.91108	-.00686	.00383 -.00313 1.00918 -.42062
0	.718	25.561	.28710	1.20722	-.00652	.00900 -.00065 0 .23782
0	2.000	-.001	.77980	.96526	-.00729	.00783 -.00447 1.20722 -.54717
0	.719	30.747	.28776	1.31865	.02351	.01062 .00012 0 .21822
0	2.000	-.003	.92137	.98627	-.00673	.00919 -.00533 1.31865 -.58841

NAA SISO SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)
 SAL NO. 201 (X/D)=.61, THETA= 0 CONFIGURATION..(46)=E20 T11 C11 (Z/D)=.044 RUN NO. 73
 TEST NO. RUN.LOG ALPHA C CL CX CPM CYM.STAB CRM.STAB (DP/Q)B (L/D)
 MACH NO. - REIT YAW C (CN)BODY (CA)BODY (CY)BODY CRM.BODY CD (X CP/D)

1207	73.720	.001	.00975	.64761	.01749	.00723	.00084	0	.01506
2040	2.000	-.007	.00976	.64761	-.00897	.00723	.00084	.64761	-0
0	.721	-3.121	-.10373	.70634	.08168	.00481	.00087	0	-.14686
0	2.000	-.004	-.14202	.69965	-.00556	.00476	.00113	.70634	-.25166
0	.722	1.040	.04685	.66349	-.00189	.00752	.00065	0	.07061
2.000	-.008	.05888	.66253	-.00968	.00753	.00051	.66349	-.08284	
0	.723	2.082	.08710	.68400	-.02351	.00672	.00082	0	.12734
2.000	-.007	.11189	.68038	-.00887	.00674	.00057	.68400	-.13233	
0	.724	3.119	.11805	.71274	-.04004	.00707	.00096	0	.16563
0	3.000	-.008	.15665	.70526	-.00961	.00712	.00057	.71274	-.15630
0	.725	5.187	.16327	.77464	-.06151	.00681	.00117	0	.21077
0	3.000	-.010	.23263	.75671	-.01031	.00689	.00055	.77464	-.20247
0	.726	7.256	.19561	.84784	-.07308	.00693	.00136	0	.23071
0	3.000	-.011	.30111	.81635	-.01104	.00705	.00047	.84784	-.24801

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(46)=E20 T11 C11	(Z/D)=.044	RUN NG. 13
TEST NO.	RUN.LOG	ALPHA C	CL	CX	CPM
MACH NO.	REIT	YAW C	(CN) BODY	(CA) BODY	(CY) BODY
1207	73.727	10.352	.21984	.93249	-.07455
2040	3.000	-.013	.38380	.87782	-.01131

1207

2040

NAA S1SD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 0	CONFIGURATION..(48)=E20 T11 C14	(Z/D)=.044	RUN NO. 74
TEST NO.	RUN.LOG	ALPHA C	CX	CPM	CYM.STAB CRM.STAB (DP/Q)B (L/D)
MACH NO.	REIT	YAW C (CN)BODY	(CA)BODY	(CY)BODY	CYM.BODY CRM.BODY CD (X CP/D)
1207	74.728	-.006	.00074	.61143	.01749 .01038 -.00075 0 .00121
681	2.000	-.029	.00068	.61143	-.02949 .01038 -.00075 .61143 -0
0	.729	-3.115	-.13970	.73080	.07875 .00028 .00101 0 -.19115
0	2.000	.003	-.17919	.72213	.00199 .00022 .00103 .73080 -.34786
0	.730	1.052	.08553	.66259	-.01227 .00673 -.00018 0 .12908
2.000	-.020	.09768	.66091	-.01997	.00673 -.00030 .66259 -.18669
0	.731	2.083	.12060	.70641	-.02421 .00510 .00002 0 .17072
0	2.000	-.012	.14619	.70156	-.01298 .00510 -.00017 .70641 -.23325
0	.732	3.112	.15066	.74294	-.03393 .00445 0 0 .20279
0	2.000	-.010	.19076	.73367	-.01101 .00444 -.00024 .74294 -.26293
0	.733	5.166	.19776	.80082	-.04640 .00419 .00046 0 .24694
0	3.000	-.008	.26905	.77976	-.00933 .00422 .00008 .80082 -.31001
0	.734	7.204	.21323	.84793	-.04768 .00361 .00043 0 .25147
0	3.000	-.007	.31787	.81450	-.00825 .00364 -.00002 .84793 -.34726

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S1D62-1063

NAA SISO SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT.. (USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61,	THETA= 0	CONFIGURATION..(48)=E20 T11 C14	(Z/D)= .044	RUN NO. 74			
TEST NO.	RUN.LOG	ALPHA C	CL	CX	CPM	CYM-STAB	CRM-STAB	(DP/Q)B	(L/D)
MACH NO.	REIT	YAW C	(CN) BODY	(CA) BODY	(CY) BODY	CYM.BODY	CRM.BODY	CD	(X CP/D)
1207	74.735	10.236	.19511	.90160	-.04107	.00248	.00050	0	.21640
681	3.000	-.005	.35219	.85259	-.00538	.00253	.00005	.90160	-.38687

NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 20	CONFIGURATION..(48)	E20 T11 C14 (Z/D)=.044	RUN NO. 75
TEST NO.	RUN LOG	ALPHA C CL	CX CPM	CRM. STAB CRM. STAB (DP/Q) B (L/D)	
MACH NO.	REIT	YAW C (CN) BODY (CA) BODY	(CY) BODY	CYM. BODY CRM. BODY CD (X CP/D)	
1207	75.736	20.192 .21109	.95286 -.04117	-.00496 -.00117	0 .22153
681	2.000	.007 .52696	.82147 .00120	-.00425 -.00281	.95286 -.46328
0	.737	15.110 .19383	.96964 -.04039	-.00468 -.00030	0 .19990
0	2.000	.011 .43984	.88562 .00497	-.00444 -.00151	.96964 -.42957
	.738	25.281 .23774	.93624 -.03820	.01130 .00313	0 .25393
2.000	.019	.61473 .74509	.00552 .01155	-.00200 .93624	-.49453
	.739	30.407 .27993	.94901 .00251	.00144 -.00586	0 .29497
	2.000	-.019 .72169	.67686 -.01502	-.00172 -.00579	.94901 -.57221

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C-

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NAA SISD SUPERSONIC AERO LABORATORY TEST DATA PRINTOUT..(USE EDPM PROGRAMS 2K178+624) JOB NO.(3772-03)

SAL NO.	201	(X/D)=.61, THETA= 40	CONFIGURATION..(48)=E20 T11 C14 (Z/D)=.044	RUN NO. 76
TEST NO.	RUN.LOG	ALPHA C CL	CX CPM CRM-STAB (DP/Q)B (L/D)	
MACH NO.	REIT	YAW C (CN)BODY	(CA)BODY (CY)BODY CRM.BODY CD (X CP/D)	
1207	76.741	40.461	.30561 1.06765 .13289 -.04848 -.06716	0 .28624
681	1.000	-.114	.92527 .61413 -.05397 -.08046 -.01965	1.06765 -.72442
0	.742	35.341	.30613 1.04436 .06342 -.04633 -.05803	0 .29313
0	1.000	-.117	.85374 .67493 -.06234 -.07136 -.02055	1.04436 -.64950
0	.743	45.540	.24904 1.10867 .19983 -.03797 -.04356	0 .22462
0	1.000	.035	.96564 .59893 .00443 -.05769 -.00342	1.10867 -.78965
0	.744	50.626	.20468 1.15261 .25788 -.01817 -.00952	0 .17758
0	2.000	.042	1.02074 .57314 .04788 -.01888 .00800	1.15261 -.83793
22600000000				

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APPENDIX "B"

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INDEX OF FIGURES

<u>Description</u>	<u>Figure</u>
A. Schlieren Photographs Launch Escape System Configurations	
M = 2.04	
E ₂₀ ^T ₁₁ ^C ₁₁	1
E ₂₀ ^T ₁₁ ^C ₁₂	2
B. Launch Escape System Characteristics X _{cp/D} , C _D , C _L , C _A , C _N , C _{m.c.g} vs α	
1. Configuration: E ₂₀ ^T ₁₁ ^C ₁₁	
M = .681	3a-f
2. Configuration: E ₂ ^T ₁₁ ^C ₁₁	
M = .681	4a-f
M = 1.575	5a-f
M = 2.04	6a-f
3. Configuration: E ₂₀ ^T ₁₁ ^C ₁₂	
M = 1.575	7a-f
M = 2.04	8a-f
4. Configuration: E ₂₀ ^T ₁₁ ^C ₁₄	
M = .681	9a-f
5. Configuration: E ₁₄ ^T ₁₁ ^C ₁₂	
M = 1.575	10a-f

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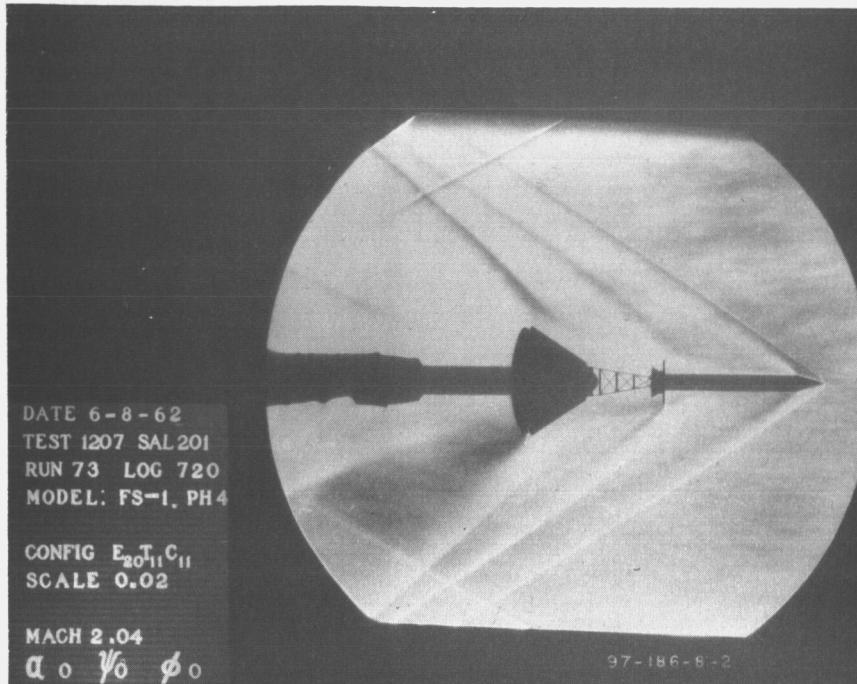


FIGURE 1
LAUNCH ESCAPE SYSTEM WITH 4 LONGITUDINAL RIBS (C₁₁), $\alpha = 0^\circ$

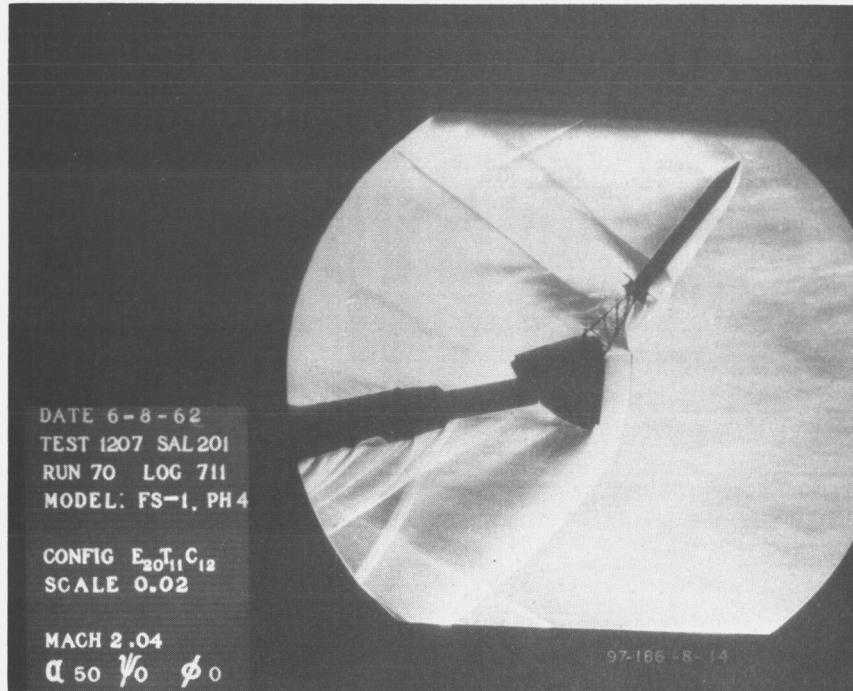


FIGURE 2
LAUNCH ESCAPE SYSTEM WITH 10 LONGITUDINAL RIBS (C₁₂) $\alpha = 50^\circ$

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LAUNCH ESCAPE SYSTEM - CHARACTERISTICS

$\frac{X_{CP}}{D}$ vs α

* TOWER
No. 16B/
RN = 312 + 10³

$\frac{X_{CP}}{D}$

.2

10 20 30 40 50 60 70 80 90 100 deg

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SYM RUN e B CONFIG

o	53	0
o	24	20
o	35	40

H.O.

FIG 3a

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$\frac{X_{CP}}{D}$

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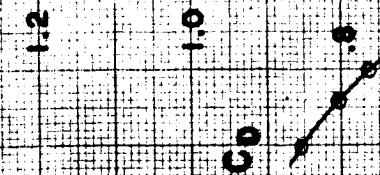
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

 C_D vs α TEST C TOWER
 $M_0 = 60/\text{lb}$ 

SYM RUN 9 4B CONFIG

0 53 0
0 84 0
0 25 0

FIG 36

CD vs α
0 10 20 30 40 50 60 70 80 90

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CD vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

CL vs Q
 CL vs C
 CL vs G
 CL vs R
 CL vs TOWER
 CL vs RW

CL

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FIG 3c

CL vs Q

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LAUNCHED ESCAPE SYSTEM CHARACTERISTICS

C_4 vs C_1 at $\frac{C_2}{M} = \text{constant}$
 C_4 vs C_1 at $\frac{C_2}{M} = \text{constant}$
 C_4 vs C_1 at $\frac{C_2}{M} = \text{constant}$
 C_4 vs C_1 at $\frac{C_2}{M} = \text{constant}$

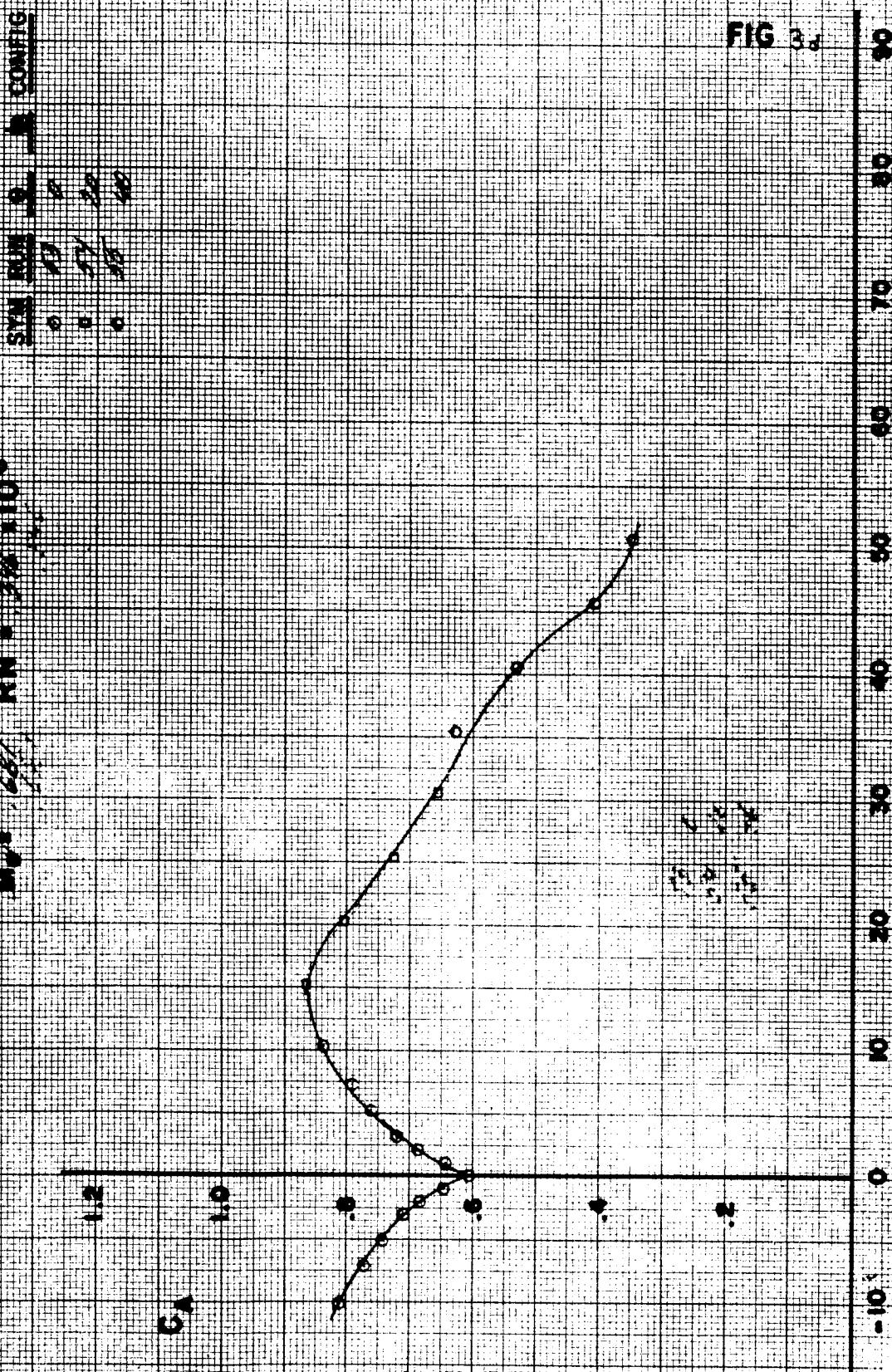


FIG. 3d

8

G

G

G

G

G

G

G

G

G

G

G

G

G

G

G

G

G

G

G

G

C4

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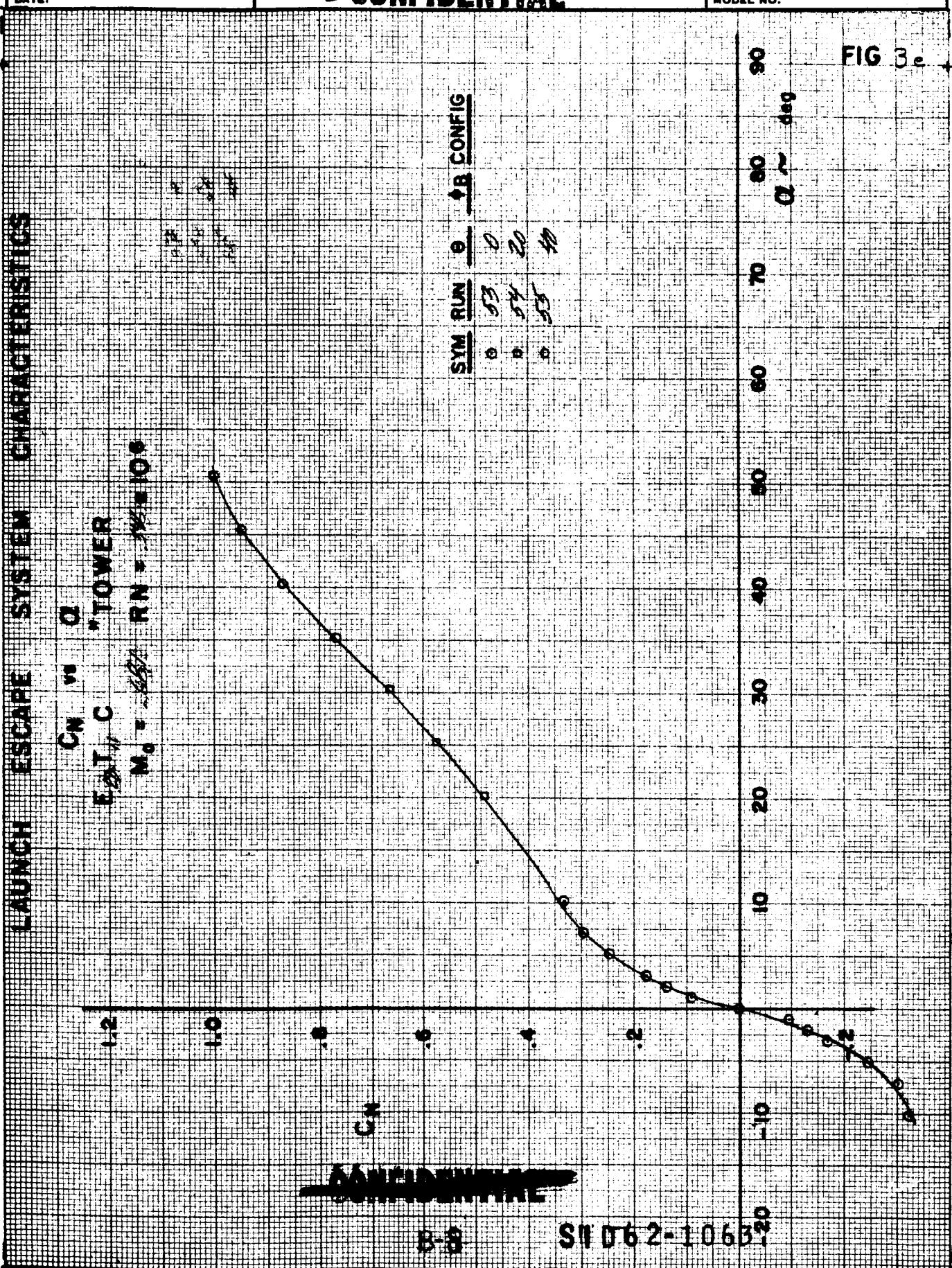
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Cn vs α

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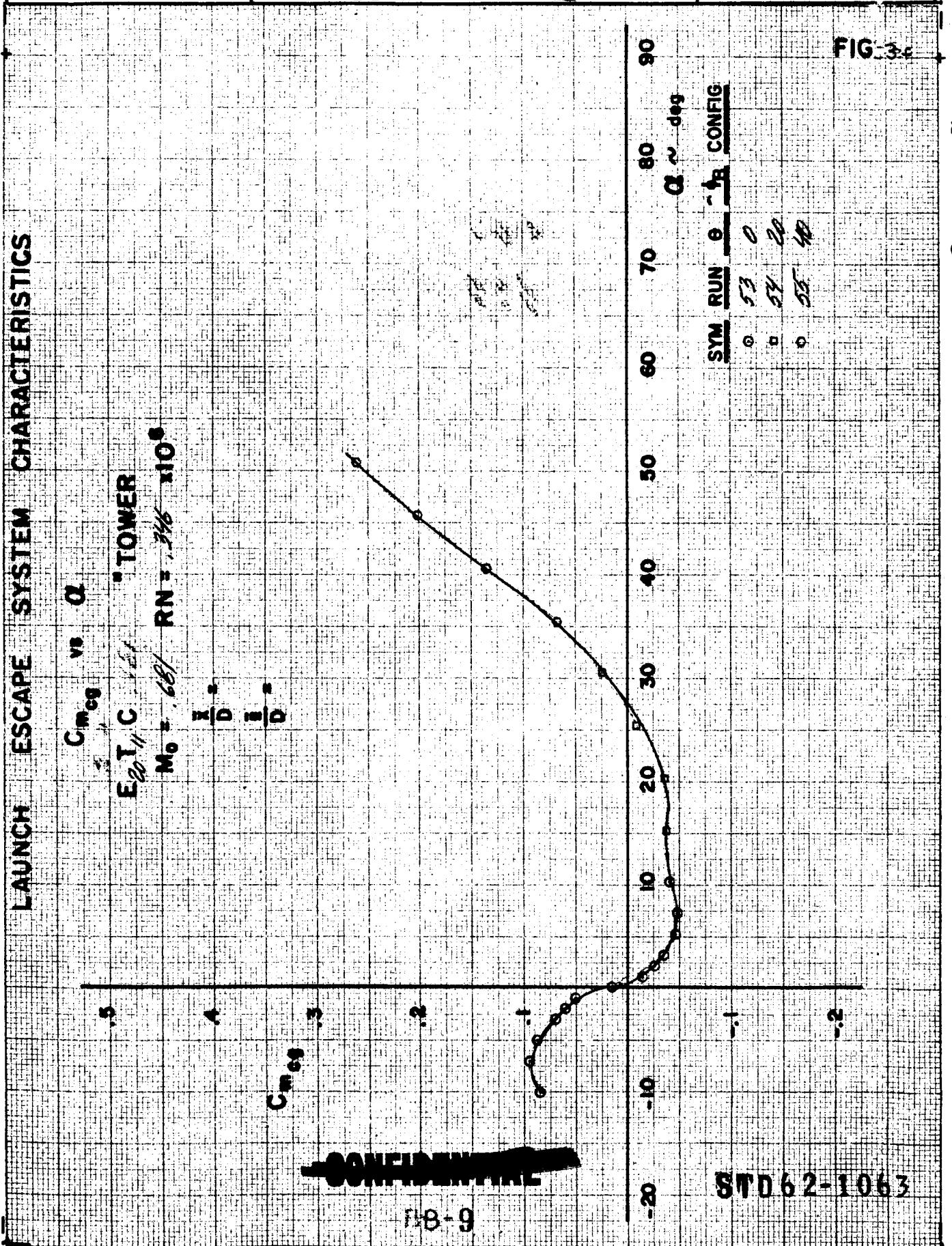
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LAUNCH ESCAPE SYSTEM TEST RESULTS

 $\frac{X_{CP}}{D}$ EAST TOWER
RN # 324 $\frac{X_{CP}}{D}$ 90
80
70
60
50
40
30
20
10
0
-10
-20

[REDACTED]

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+1.0
+.8
+.6
+.4
+.2
0
-.2
-.4
-.6
-.8
-1.0

SYM RUN # B CONFIG

0 56 0
0 57 20
0 58 40

FIG 4a

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

 C_D vs. α No. 681 EAT/C-1 TOWER
RHS - 344 - 108 C_D

1.2

1.0

2.

SYM RUN 9 + B CONIC

22 0
0 27 0
0 38 0

FIG 4b

-20 -10 0 10 20 30 40 50 60 70 80 90 0 ~ 60

 C_D vs. α

F-8-11

END 2-1063

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LAUNCHER SYSTEM CHARACTERISTICS

 C_L E₂T₆ C₁ M_{0.1} 100' TOWER C_L

0 10 20 30 40 50 60 70 80 90 100

SYN RIN 0 deg CONFIG

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FIG. 4c

 C_L vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$E_{2a}/C_1 = 1.00$, $RN = .333$, $\theta = 10^\circ$

C_A vs α

TOWER

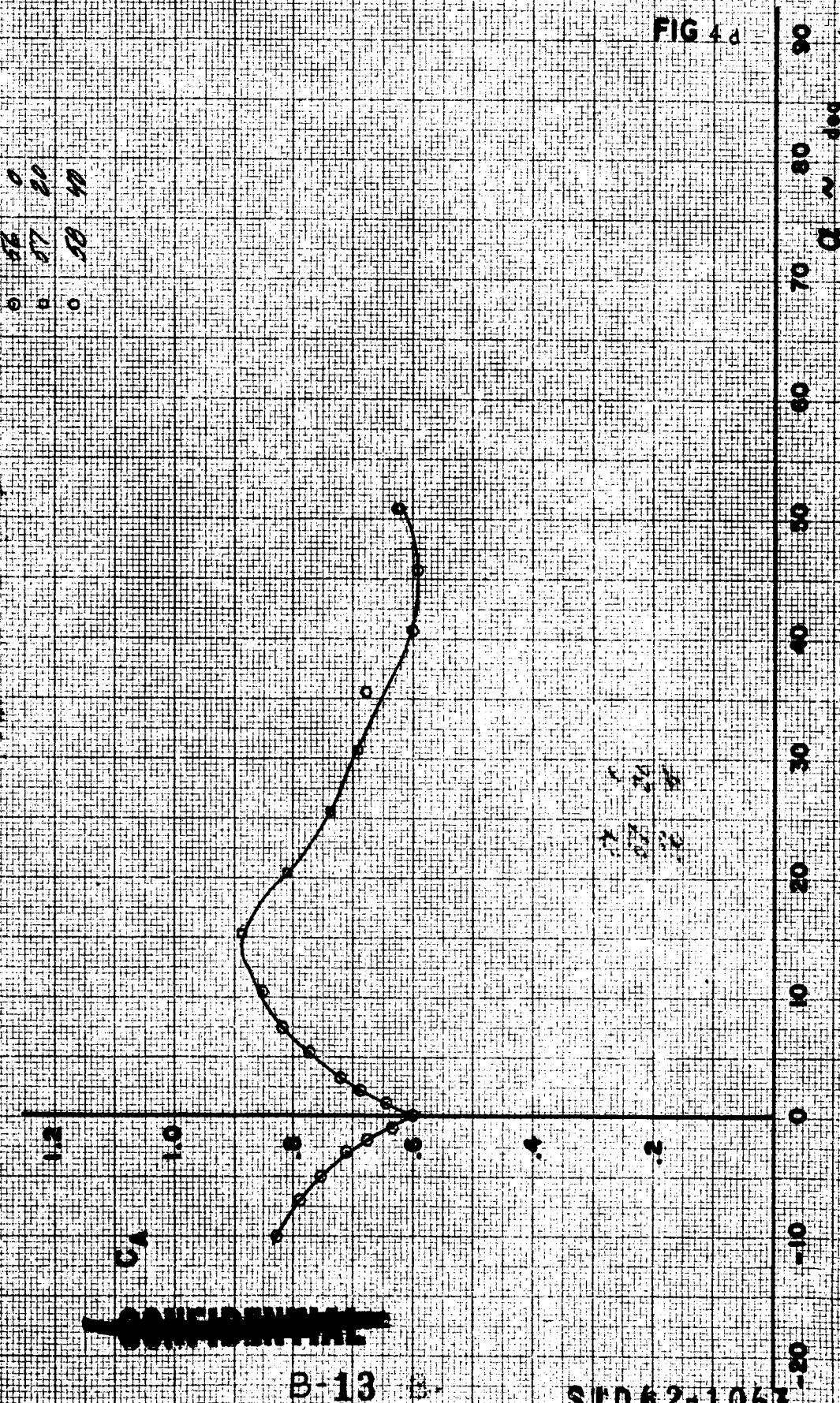


FIG 4d

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$$\text{EST. } C_N = -100 / \text{RN} + 346 \times 10^6$$

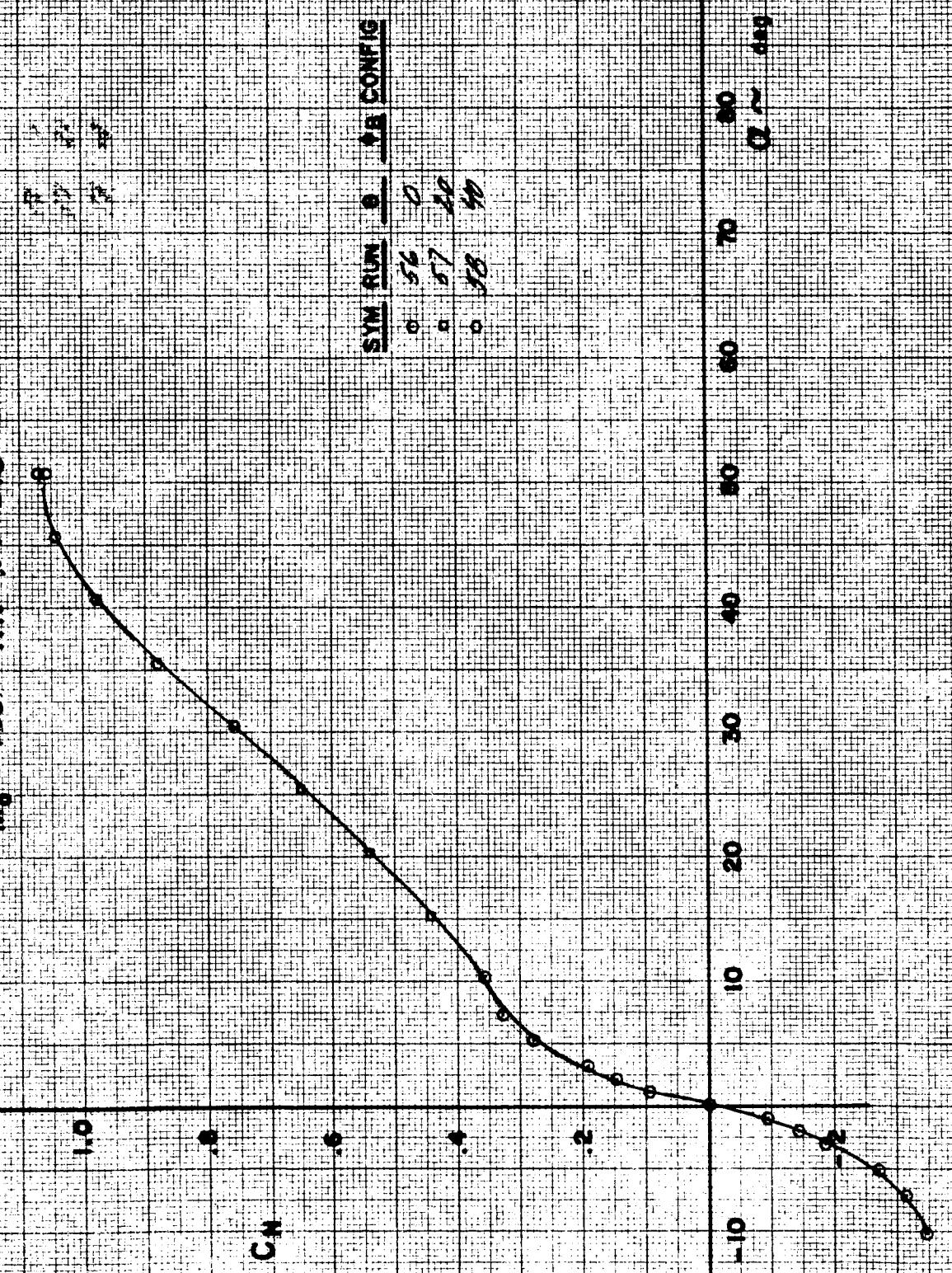


FIG. 4a

CN vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

C_{neg} vs α

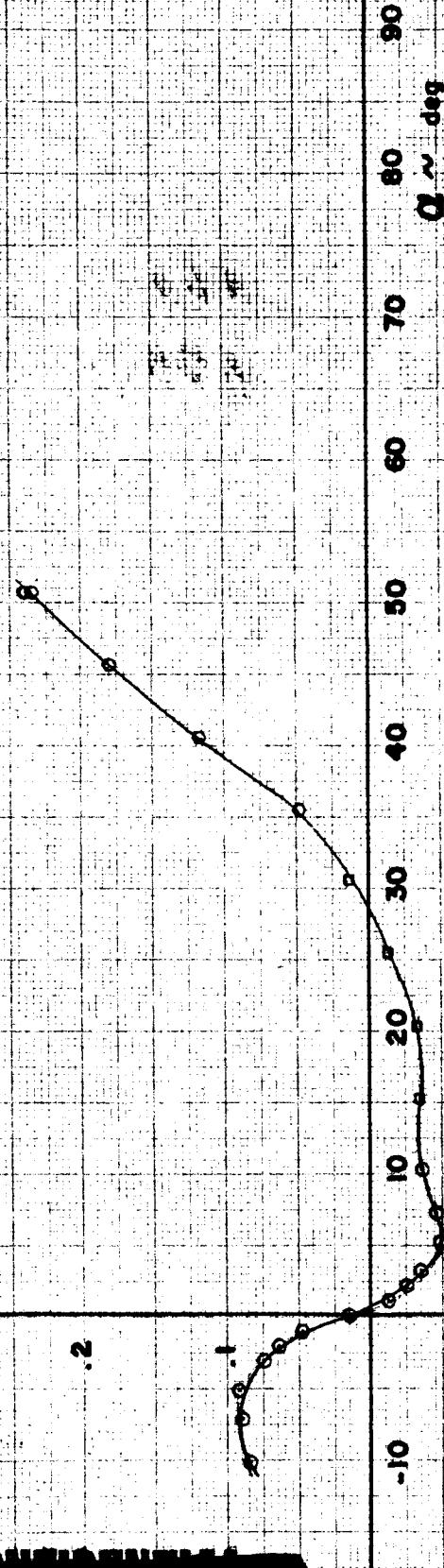
E_T TOWER
 $M_0 = 681$ RN = 346×10^3

$$\frac{\pi}{D} = \frac{\pi}{D}$$

C_{neg}

.2

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SYM RUN e - b CONFIG

○ 32 0
○ 37 20
○ 53 47

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FIG. 4e

C_{neg} vs α

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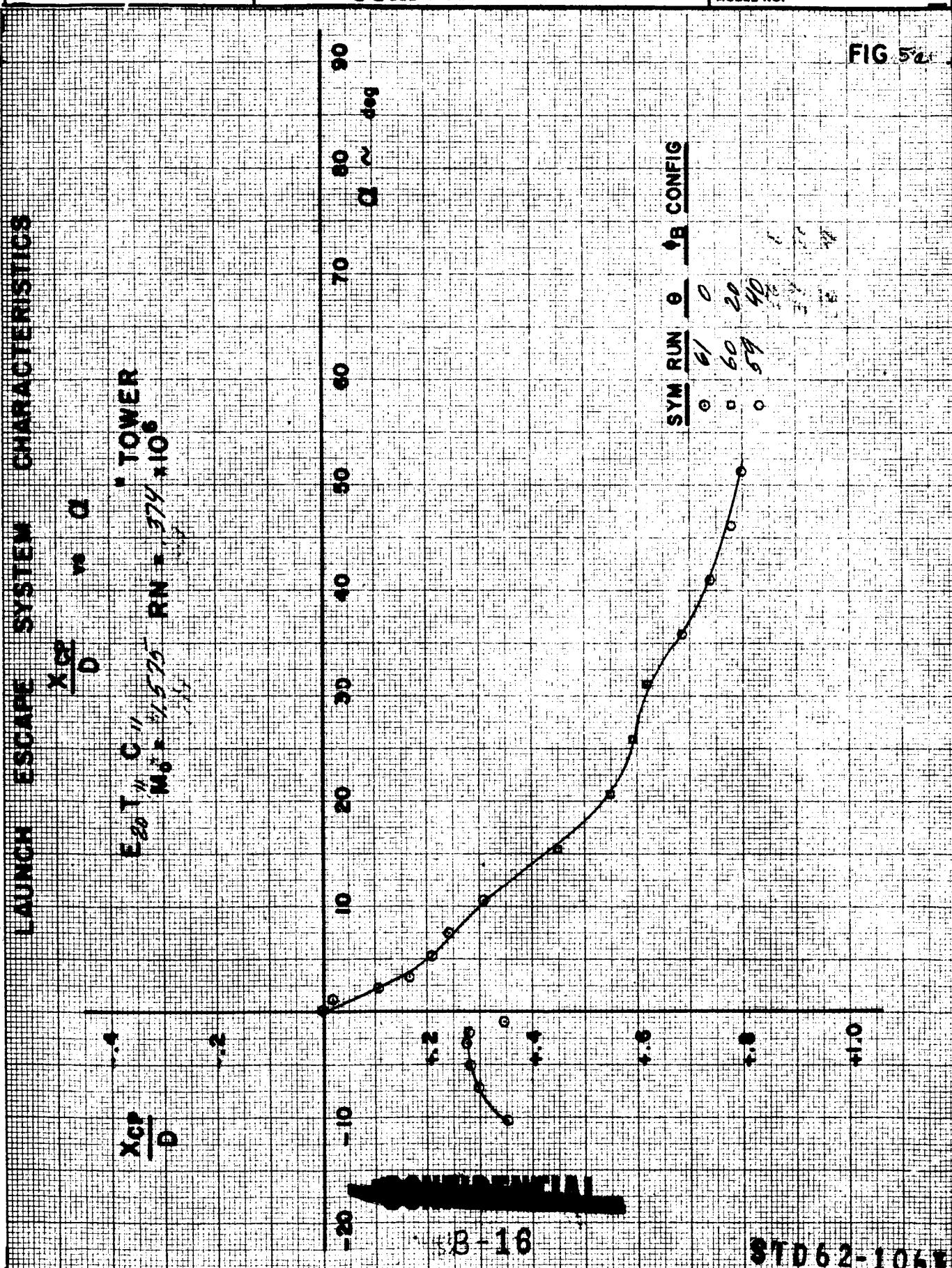
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MANUFACTURED SYSTEM CHARACTERISTICS

EGG TOWER C 11-5-23 RH = .374 *10⁶



$\frac{x_{CP}}{n}$ vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

 C_D vs α

EST C-11 TOWER
 $M_0 = 1.5$ $R_N = 374$ $\alpha_0 = 0^\circ$

1.2

1.0

 C_D

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FIG 5b

0 10 20 30 40 50 60 70 80 90 α deg

 C_D vs α

SYM RUN # CONFIG

6	41	0
0	60	20
0	59	40
0	58	60

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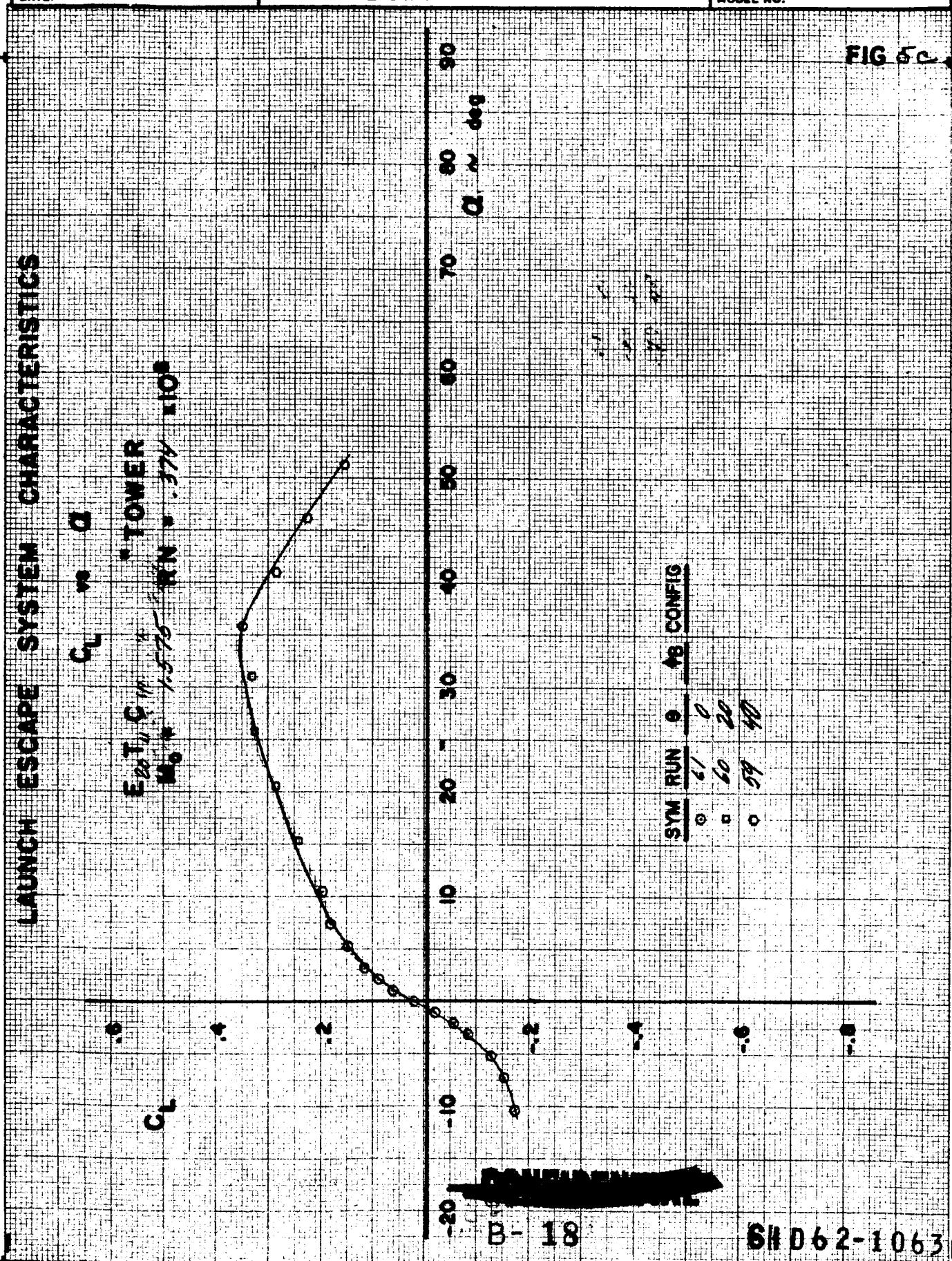
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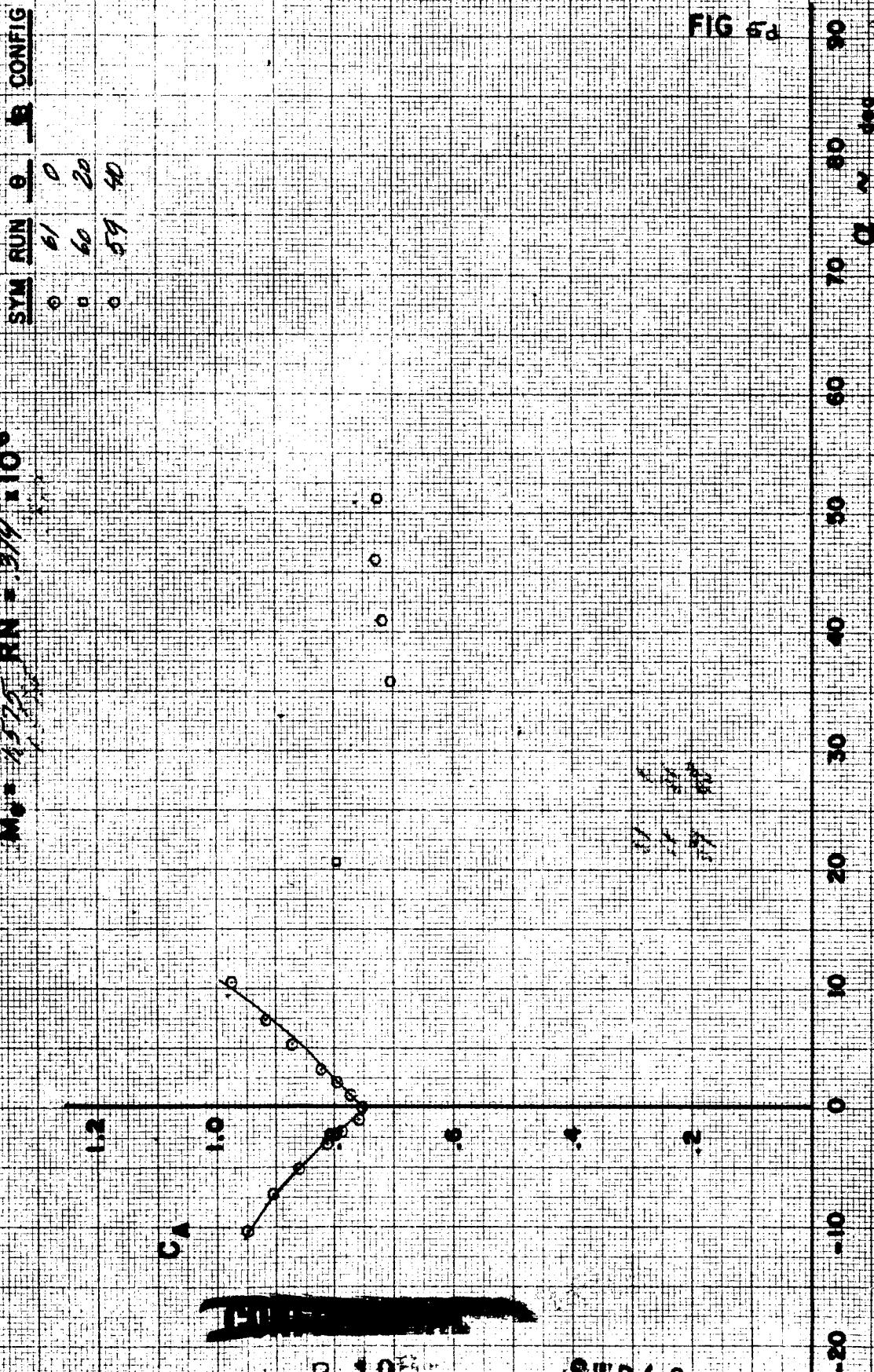
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

CA vs α
E₂₀T/G₂
M₀ = 13725 RN = 374 $\times 10^3$



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CA vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_N = \frac{C_{N0}}{C_{N0} + C_{N1}(R_N - R_{N0})}$

LEAD COCKPIT
C_{N0} = 0.752 R_{N0} = 0.000108

1.2

0.8

C_N

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SII D62-1053

80 60 40 20 10 0 10 20 30 40 50 60 80 80 60 40 20 0

FIG F2

C_N vs Q₁

LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_{m\text{eq}}$ vs α

E_{20T11} C_{II}: "TOWER"
 $M_0 = 1/575 \text{ RN} = 374 \times 10^6$

$$M_0 = \frac{\pi}{D} \frac{\pi D}{2} =$$

$C_{m\text{eq}}$

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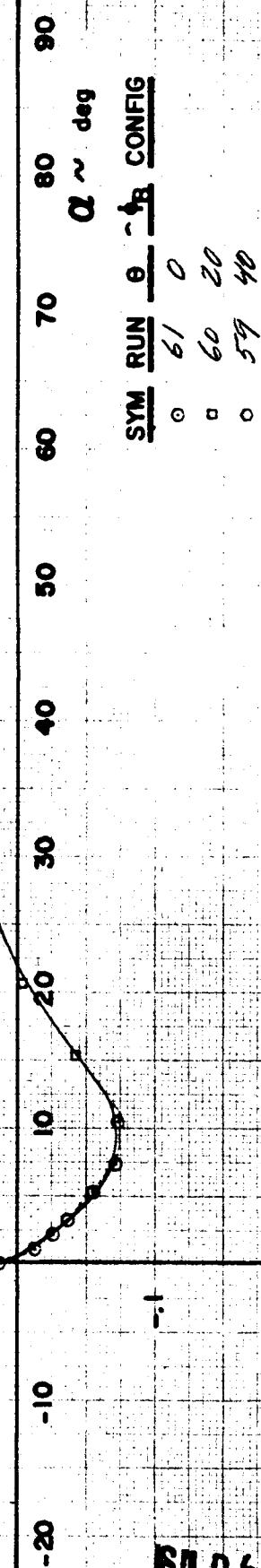


FIG. 24

$C_{m\text{eq}}$ vs α

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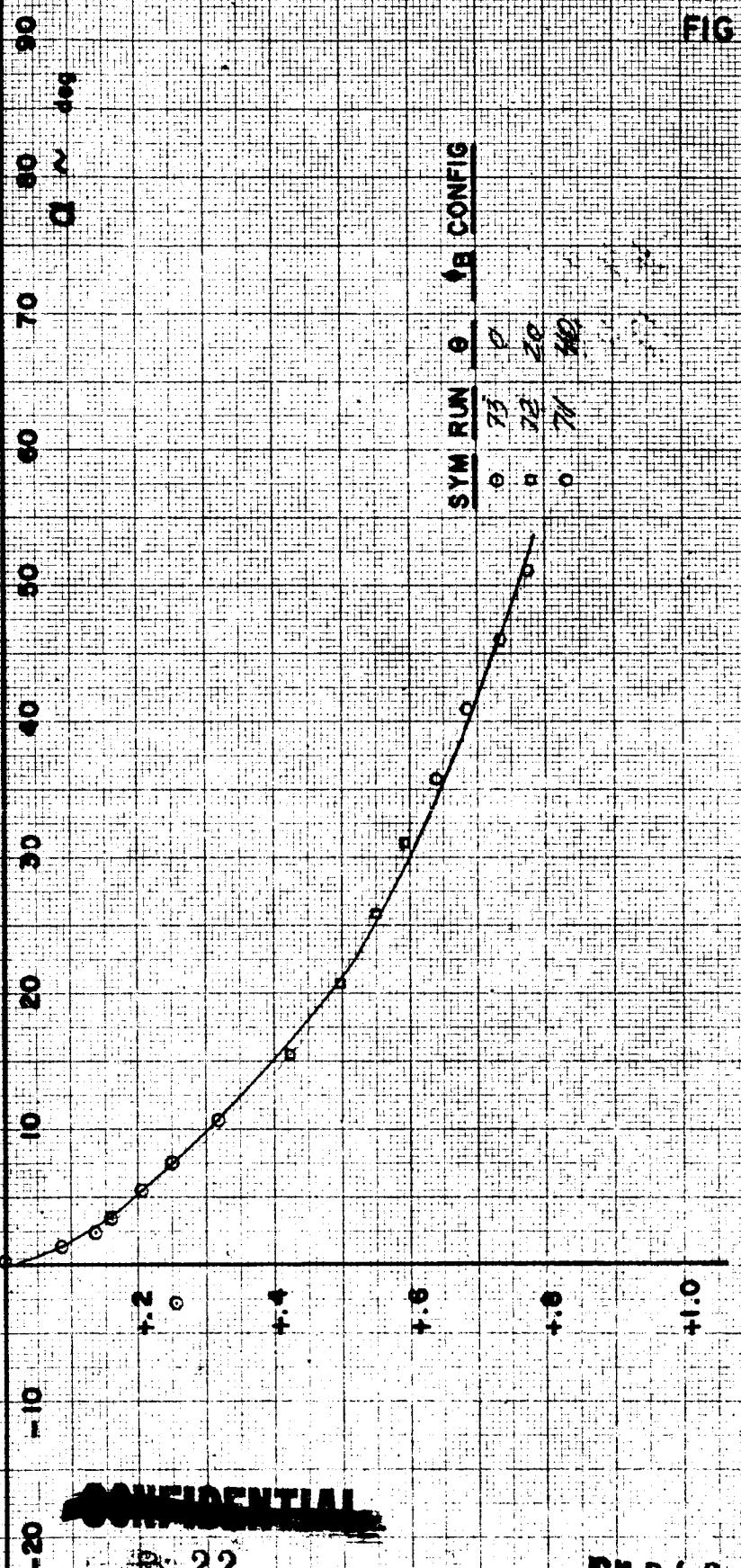
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LAUNCH ESCAPE SYSTEM CHARGES TESTS 1983

• TOWER
• CO₂
• N₂O₄
• H₂N₂XCP
 $\frac{D}{D}$
E₂ T₁ C₂ N₂O₄ H₂N₂~~CONFIDENTIAL~~

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XCP vs α

FIG 6a

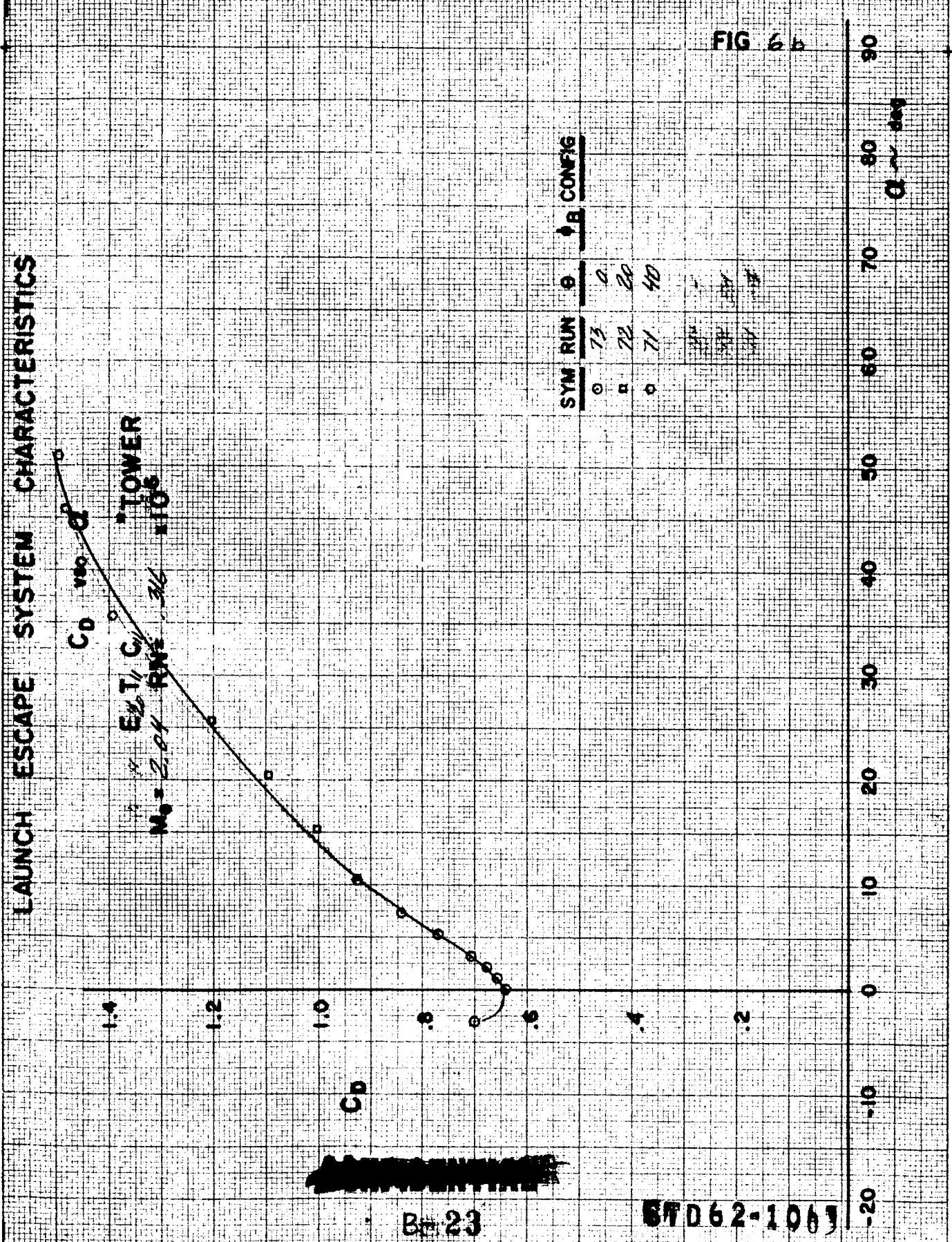
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS



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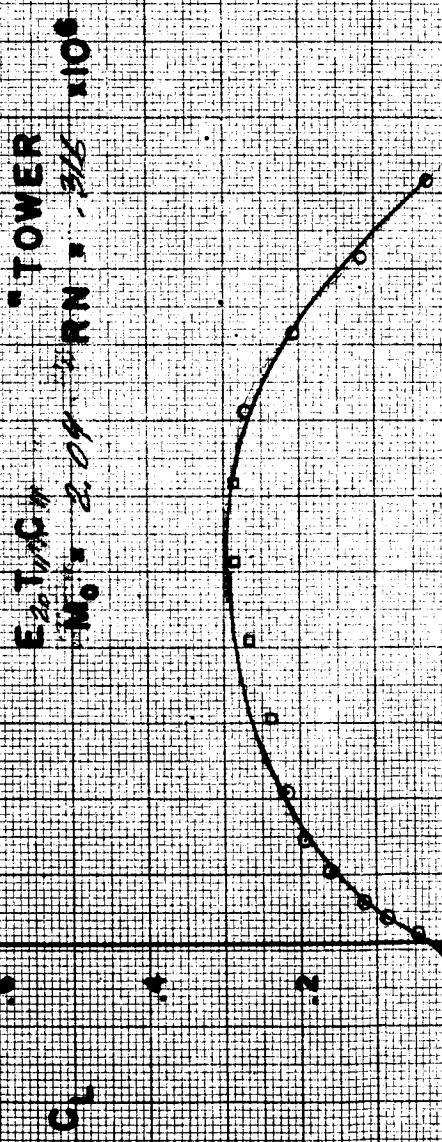
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

C_L vs α

EFFECTIVE TOWER
No. 2047 RNN - 312106

C_L



CL vs alpha

B-24

B-24

61062-1063

FIG 60

C_L vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

CA vs α

ET/C // TOWER

Note 2.04 RN = .3/6 $\times 10^6$

SYM RUN # CONFIG

0 73 0
0 72 20
0 71 40

CA

1.0

1.2

FIG 6a

0 10 20 30 40 50 60 70 80 90 100
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100

B-25

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CA vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_N \propto \alpha^2$ TOWER
 $E_{\text{LT}} = 2.22 \times 10^6$ MN $\approx 2.22 \times 10^6$

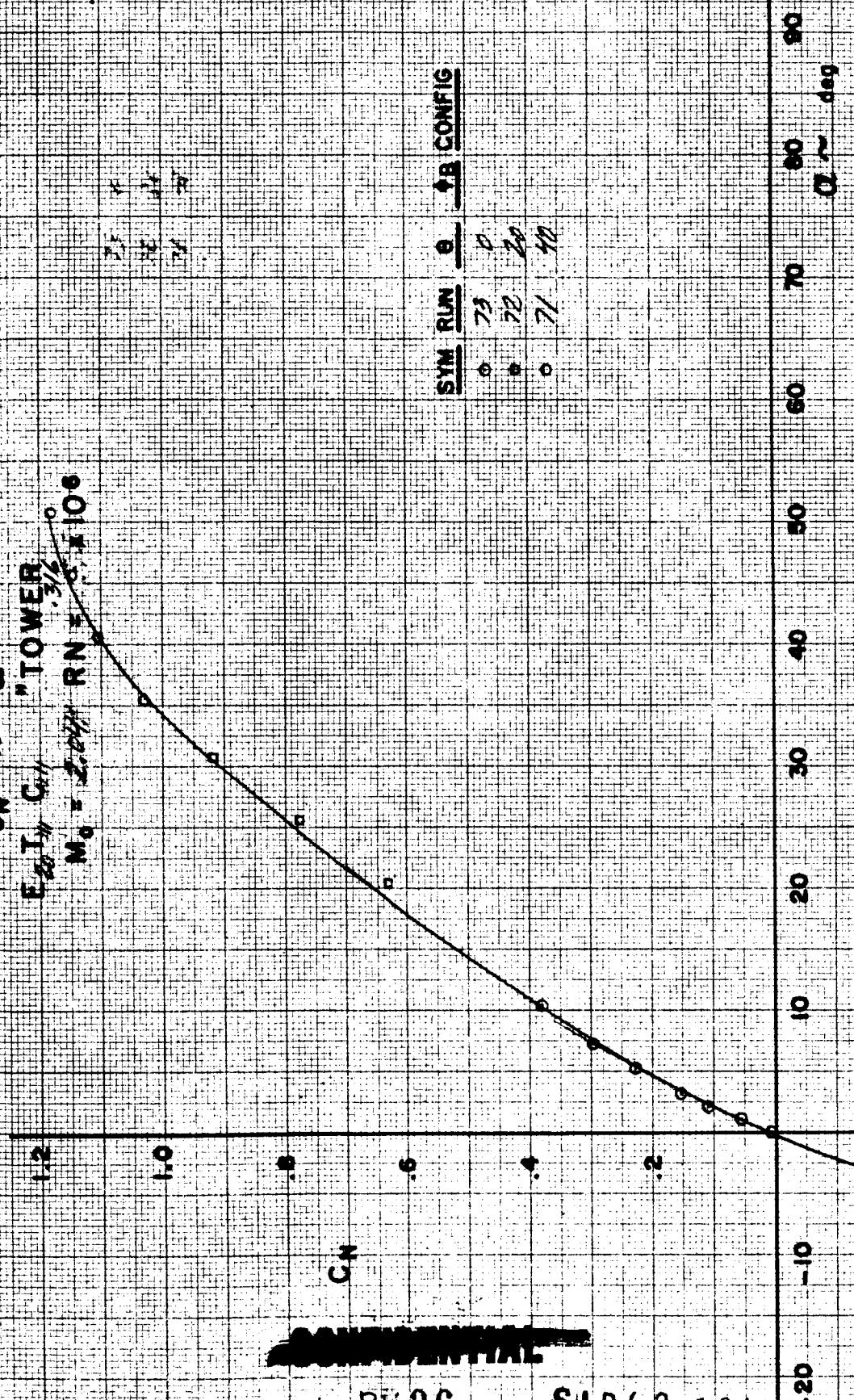


FIG 6c

Cn vs. α

B426

SII D62-1063

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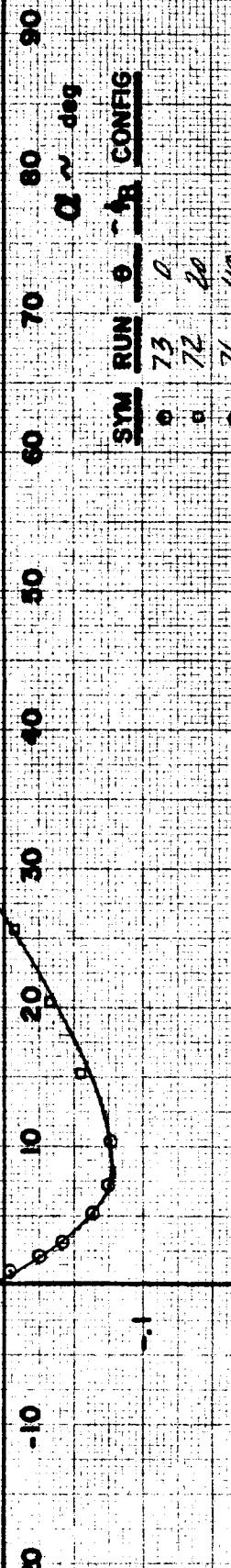
LAUNCH ESCAPE SYSTEM CHARACTERISTICS

 $C_{n\text{cg}}$ vs α

TOWER
 $E_2 T / C_{\infty} = 2.64$ RN = .316 10⁶
 $M_0 = 2.64$ $\frac{L}{D} = \frac{1}{D}$

 $C_{n\text{cg}}$ ~~CONFIDENTIAL~~

B-27



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FIG-6a

Cn_cg vs α

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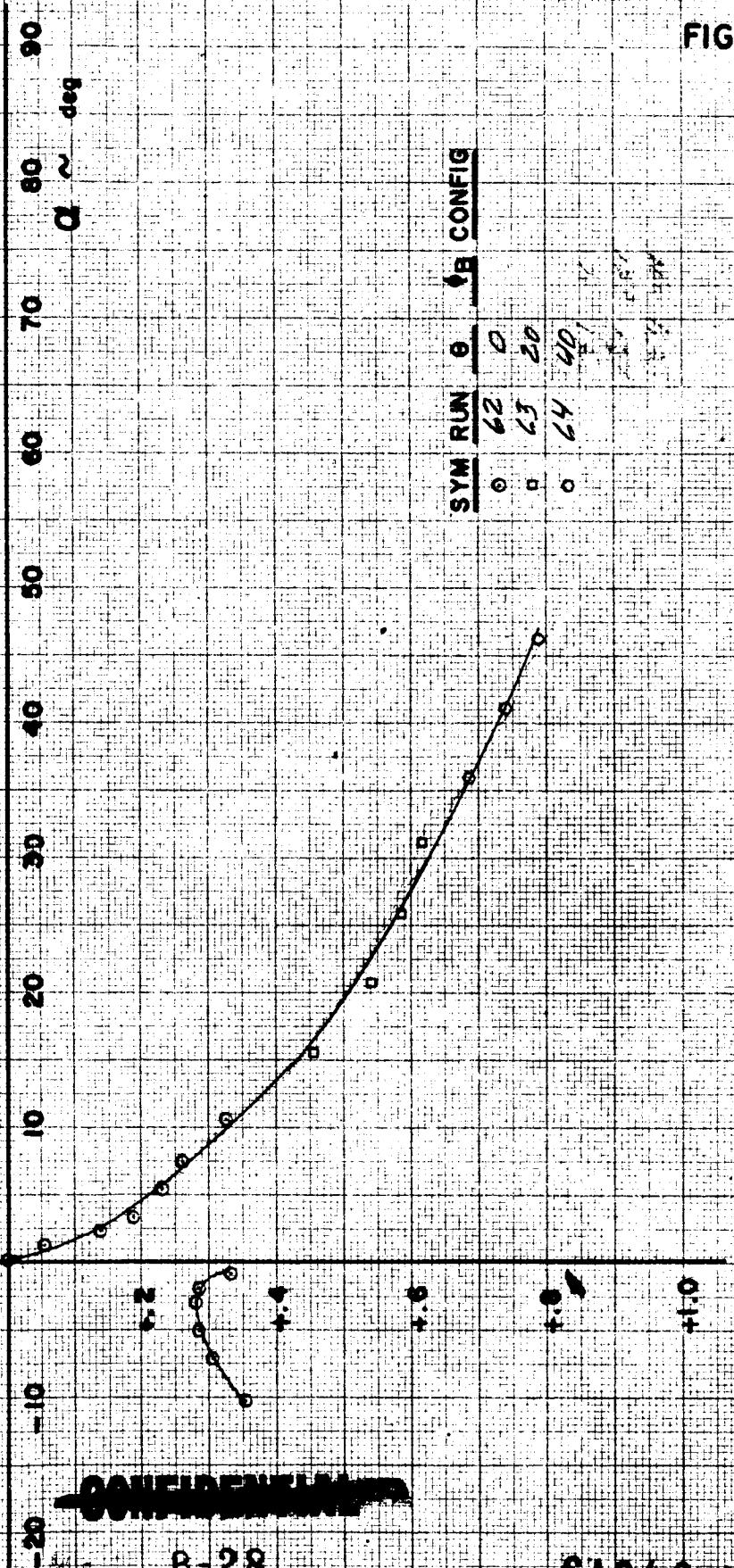
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LAUNCH ESCAPE SYSTEM - CHARACTERISTICS

$$\frac{X_{CP}}{D} = m \cdot \alpha$$

EST. C/2
M_{0.4} = 1.12
R_N = -324 ± 106

TOWER



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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

 C_D vs α

E₂₀T/C₁₂
M₀ = 4.525
RN = 374 * 10⁶

1.2

 C_D

1.0

SYM RUN # 4B CONFIG

62 63 64
65 66 67
68 69 70

FIG 7b

-20 -10 0 10 20 30 40 50 60 70 80 90
 $\alpha \sim \text{deg}$

B- 20

S1D62-1063

 C_D vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

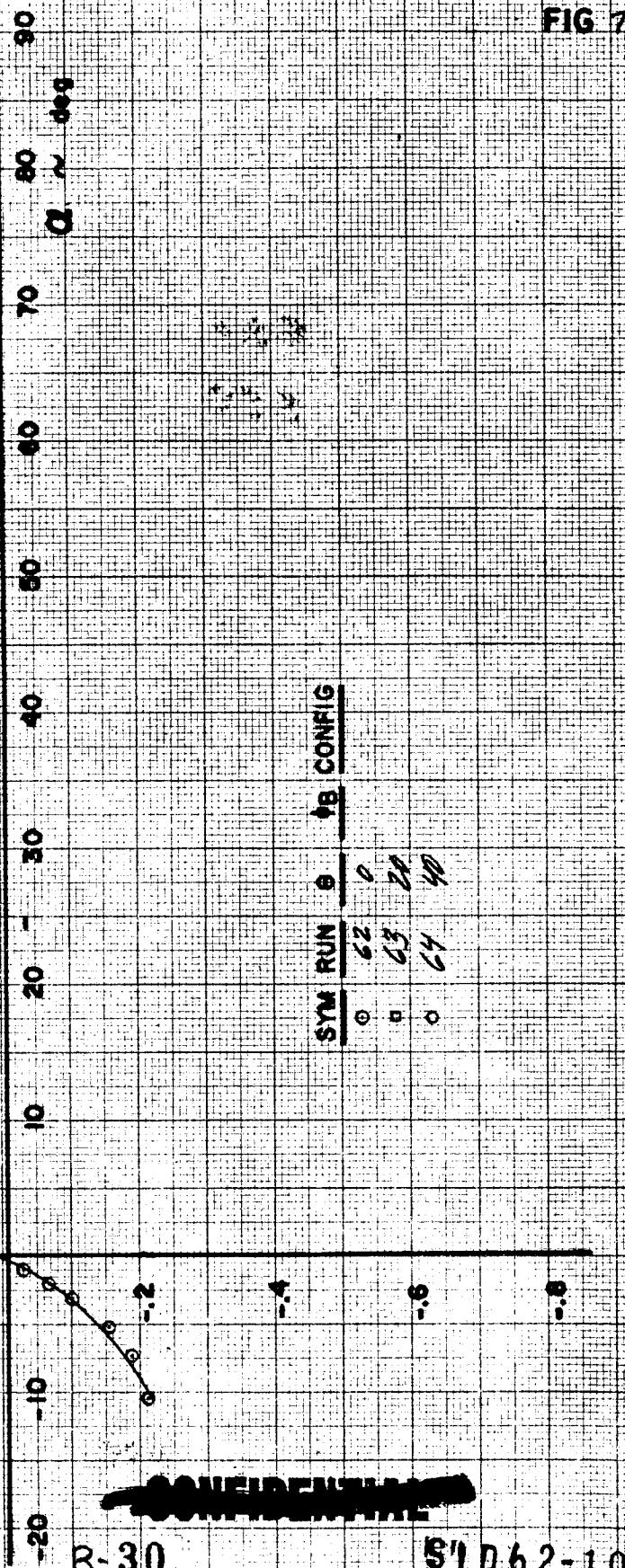
 C_L vs. α E₂₀T₁C₁₂
No. 1576
TOWER
100 C_L 

FIG 7c

CL vs. α

B-30

S1D62-1063

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

EAT/C₂ TOWER
CA vs Q

SYM RUN 9 - 1B CONING

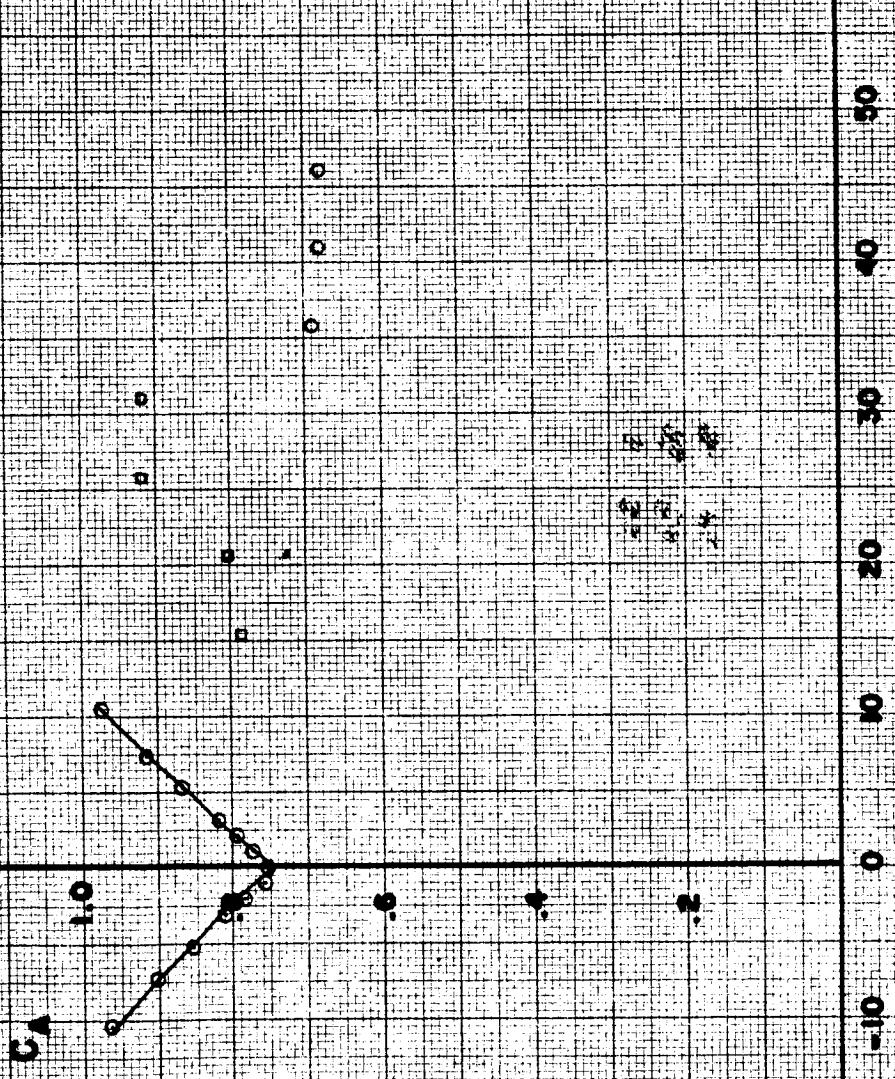
0 20 40
60 80 100
120 140 160
180 200 220
240 260 280
300 320 340
360 380 400
420 440 460
480 500 520
540 560 580
600 620 640
660 680 700
720 740 760
780 800 820
840 860 880
900 920 940
960 980 1000 $M = 1.575 \times 10^8$ $RH = 1775$ $g = 386.0$ 

FIG. 7d

B-31

61062-1063

CA vs Q

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L AUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_N \propto \alpha$
EST. C_N TOWER
 $M_0 = 177,108$

1.2

1.0

G

SYM RUN e → a CONFIG

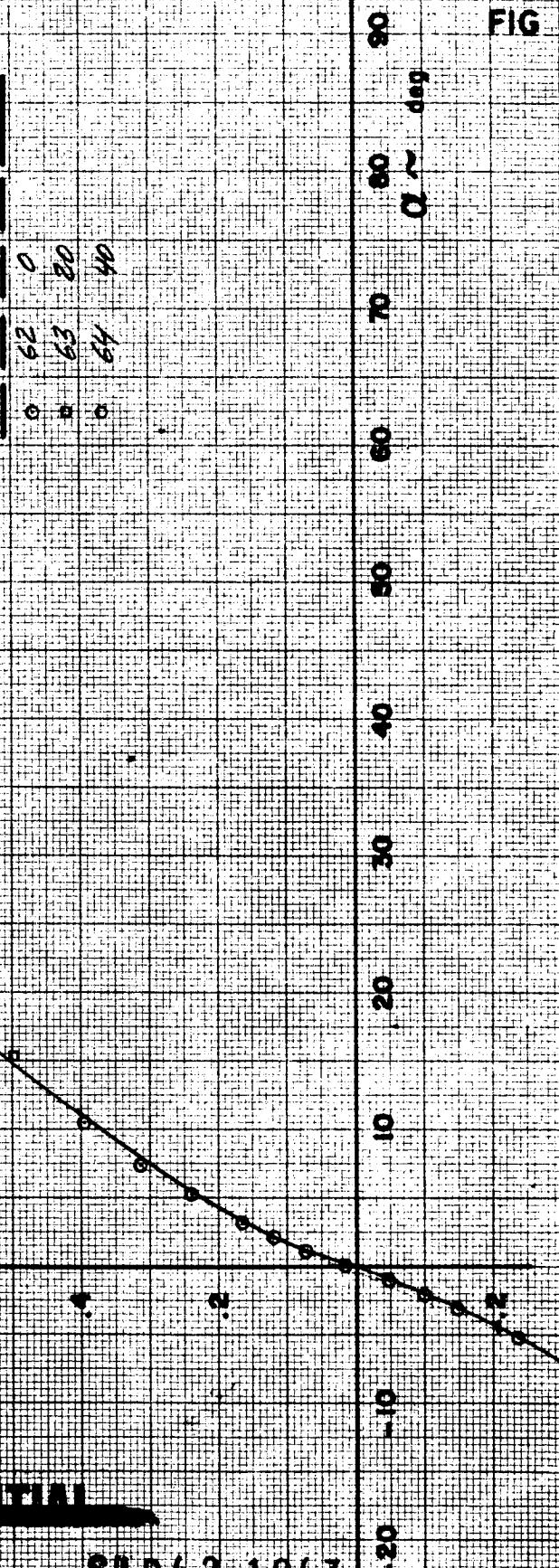


FIG 7e

$C_N \propto \alpha$

B-52

81062-1063

1

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

 C_{mg} vs α ET/C_{1/2} TOWER
 $M_0 = 1.575$ RN = 1.374×10^6

$$\frac{2}{3} \alpha - \frac{1}{3}$$

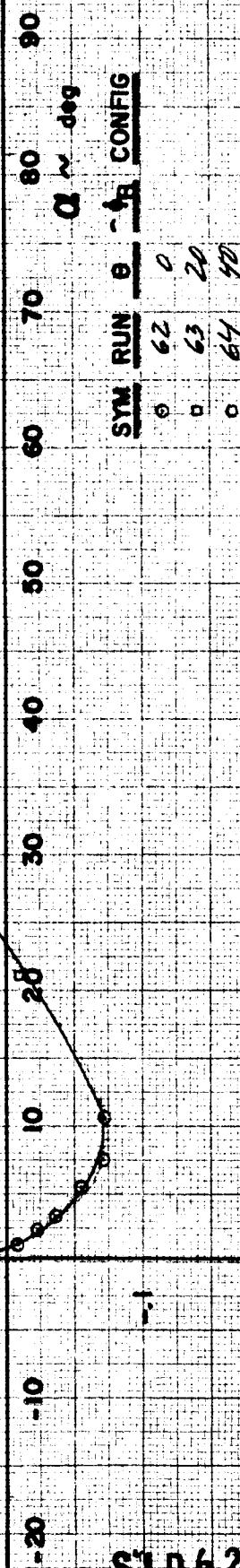
 C_{mg} vs β

[Redacted]

[Redacted]

B-33

S1D62-1063

SYM RUN B CONFIG

○	62	0
□	63	20
○	64	40

C_{mg} vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

EE20 T//C Mod 2204 RAN - 2/21/86

• TOWER • SLOPE

 $\frac{X_{CP}}{D}$

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 $\frac{X_{CP}}{D}$ 80
60
40
20
0
-20
-40

deg

+2°

-2°

+8°

-8°

SYM RUN

→ B CONFIG

0

69

10

14

18

22

26

30

34

38

42

46

50

54

58

62

66

70

74

78

82

86

90

94

98

102

106

110

114

118

122

126

130

134

138

142

146

150

154

158

162

166

170

174

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330

334

338

342

346

350

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358

362

366

370

374

378

382

386

390

394

398

402

406

410

FIG B-a

S1D62-1063

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 $\frac{X_{CP}}{D}$

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_D \text{ vs. } \alpha$
 $E_{20} T_{11} C_{12}$
 $R_N = 3\frac{1}{4}$
 $M_0 = 2.44$
 TOWER * LOS

1.2

 C_D ~~CONFIDENTIAL~~~~CONFIDENTIAL~~SYM RUN α IN CONFIG

67	67
20	10
0	0

FIG 8 b

C_D vs. α

20 -10 0 10 20 30 40 50 60 70 80 90

B - 35

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C_D vs. α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

EJECTOR ROLL-OFF TOWER

CL = C

100
80
60
40
20
0
-20
-40
-60
-80
-100

SYM RUN # 18 CONTC

SYM SS

FIG 8c

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_A \propto \alpha$
 $E^2 T / C_{12}^2$
 $M = 2.04$ RN = $5.5/6$

SYM RUN # CONFIG

0 69 0
 0 70 60

 C_A

1.0

0.0

-1.0

-2.0

-3.0

-4.0

-5.0

-6.0

-7.0

-8.0

-9.0

-10.0

-11.0

-12.0

-13.0

-14.0

-15.0

-16.0

-17.0

-18.0

-19.0

-20.0

-21.0

-22.0

-23.0

-24.0

-25.0

-26.0

-27.0

-28.0

-29.0

-30.0

-31.0

-32.0

-33.0

-34.0

-35.0

-36.0

-37.0

-38.0

-39.0

-40.0

-41.0

-42.0

-43.0

-44.0

-45.0

-46.0

-47.0

-48.0

-49.0

-50.0

-51.0

-52.0

-53.0

-54.0

-55.0

-56.0

-57.0

-58.0

-59.0

-60.0

-61.0

-62.0

-63.0

-64.0

-65.0

-66.0

-67.0

-68.0

-69.0

-70.0

-71.0

-72.0

-73.0

-74.0

-75.0

-76.0

-77.0

-78.0

-79.0

-80.0

-81.0

-82.0

-83.0

-84.0

-85.0

-86.0

-87.0

-88.0

-89.0

-90.0

-91.0

-92.0

-93.0

-94.0

-95.0

-96.0

-97.0

-98.0

-99.0

-100.0

FIG 8d

80

86

82

88

94

100

106

112

118

124

130

136

142

148

154

160

166

172

B-37

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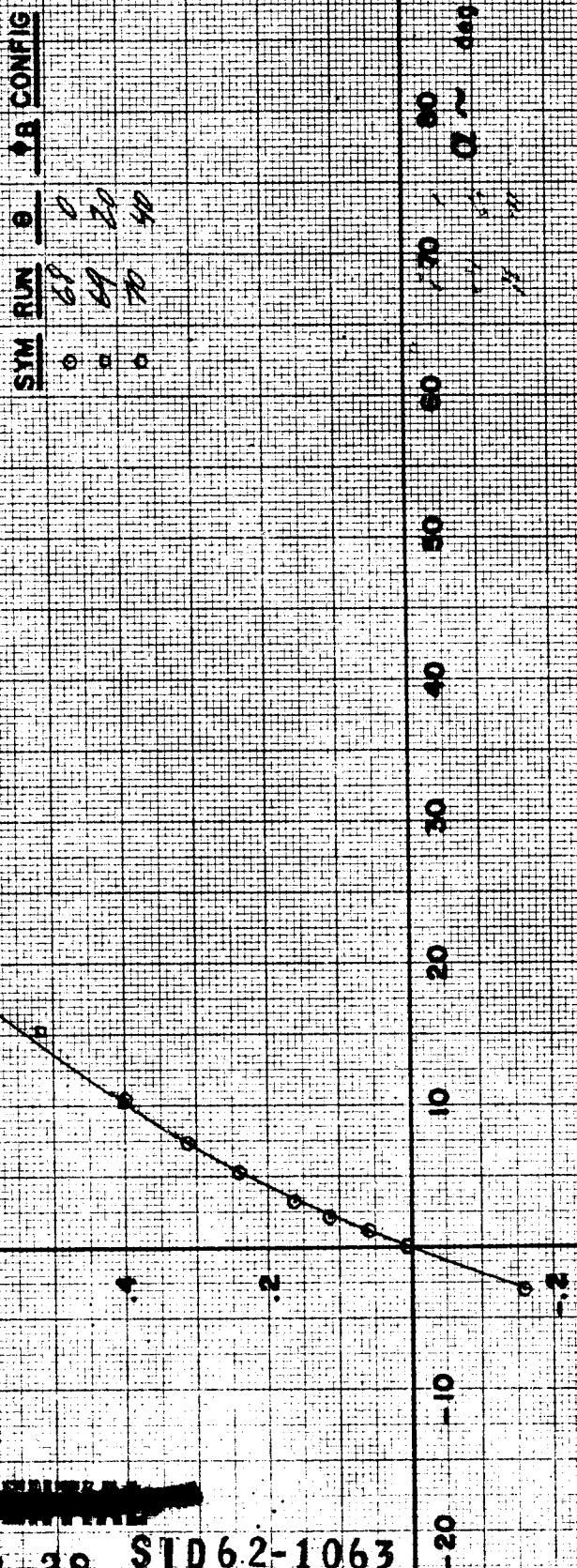
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$E_2 = T_1, C_2 = 2.24, R_N = 1.2, \alpha = 10^\circ$

$M_0 = 1.0$

 C_n

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Cn vs alpha

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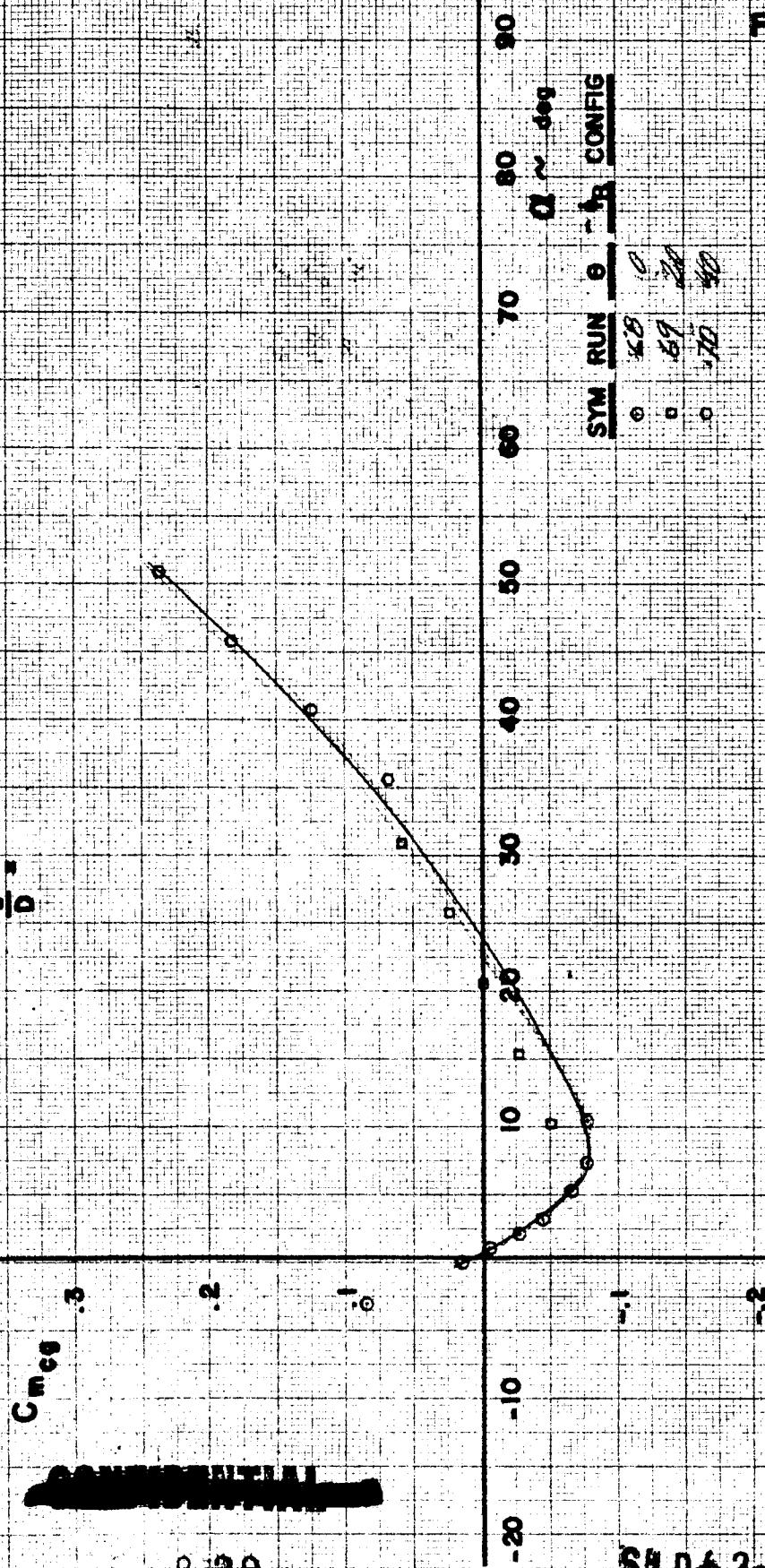
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_m \text{ vs } \alpha$

ETG TOWER RN 30°
Mo = $\frac{2}{D}$ $\frac{2}{D}$



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CM vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$$\frac{X_{CP}}{\alpha} = \frac{D}{Q}$$

E-10 TOWER C-14
E-10 TOWER C-14
E-10 TOWER C-14
E-10 TOWER C-14

$$\frac{X_{CP}}{\alpha} = \frac{D}{Q}$$

100
80
60
40
20
0

SYM RUN Q D CONFIG

74 0
75 0
76 0

FIG 2a

X_{CP} vs α

B-40

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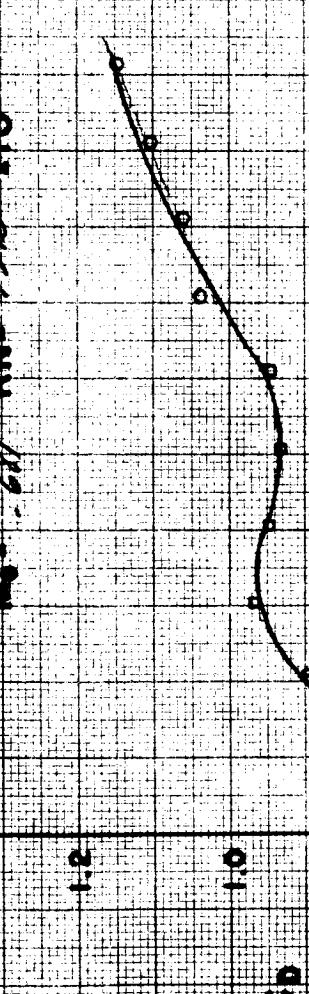
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_D = \frac{C}{A}$

$E_{10} T / C_1 Y$
 $M_{10} = 6.2$
 $R_N = 3\frac{1}{2}$
 $H_{10} = 10s$



SYM RUN # B CONFIG

74 0
25 20
76 40

FIG 9b

C_D vs α

20

10

0

-10

-20

-30

-40

C_D vs α

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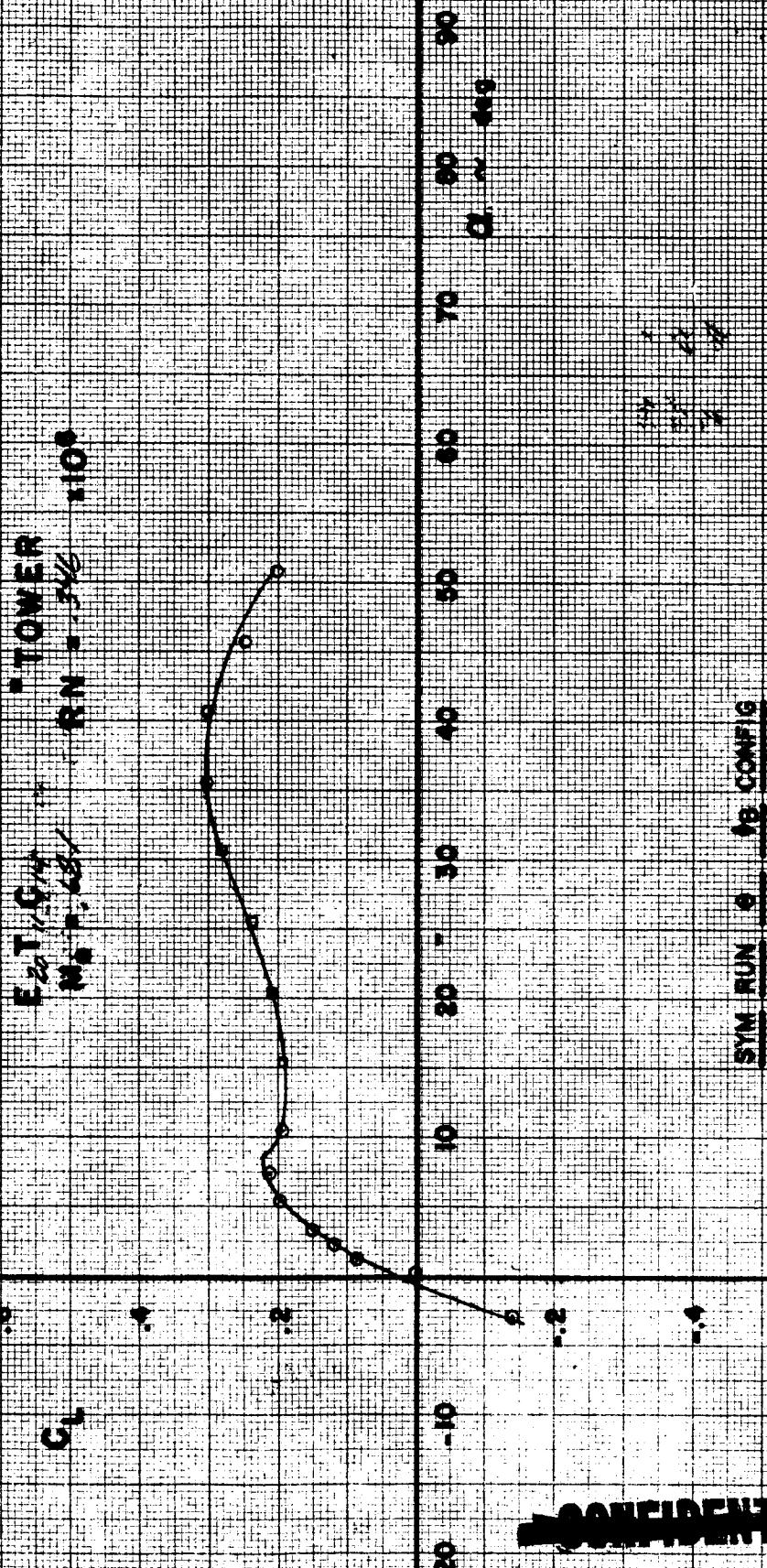
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LAWSON ESCAPE SYSTEM CHARTERISTICS
 C_L vs Q
 E_T, G_M, TOWER, ROLLING HIGH



SYM RUN # 16 CONFIG

FIG ac

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C_L vs Q

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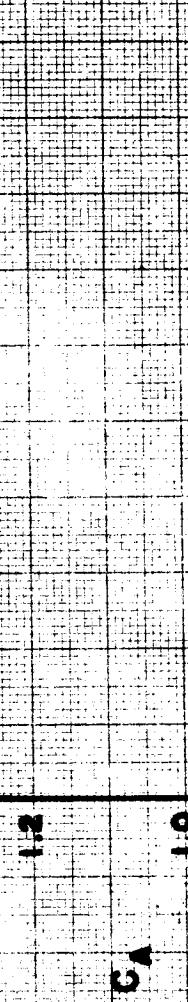
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

TEST COUNTER

RUN # 100



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S1D62-1063

FIG 9.1

100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100

C 4 " Q

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_n \sim C_a$ TOWER
 $N_o = 1.07 R_N = .22108$

1.2

1.0

C_n

B544 81062-1063

SYM RUN θ Φ_B CONFIG

○ 74°
○ 72°
○ 70°
○ 76°
○ 78°
○ 80°

80
60
40
30
20
10
0

$\alpha \sim \text{deg}$

FIG 9e

C_n vs α

LAUNCH ESCAPE SYSTEM CHARACTERISTICS

$C_{n\alpha g}$ vs α
 $E_2, T_1, C_{1/4}, \text{ "TOWER"}$
 $M_0 = .677 / RN = .346 \times 10^6$

$$M_0 = \frac{\pi}{D} D = \frac{\pi}{D} D$$

$C_{n\alpha g}$

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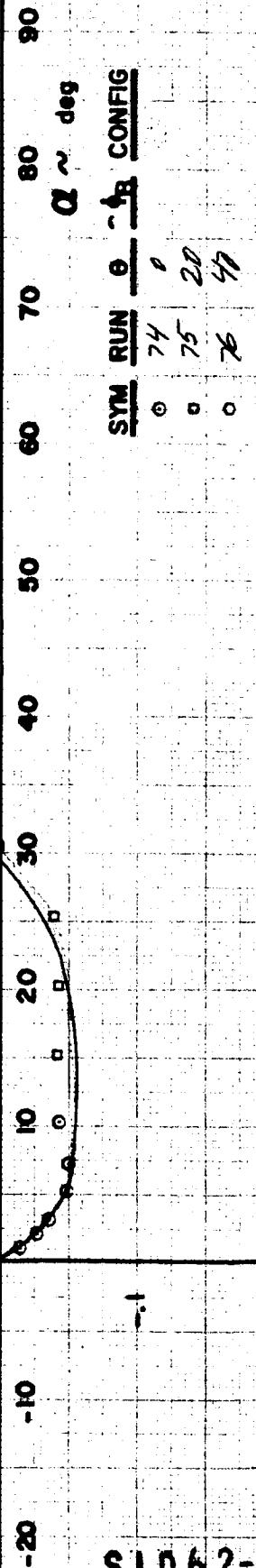
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FIG 9c

$C_{n\alpha g}$ vs α



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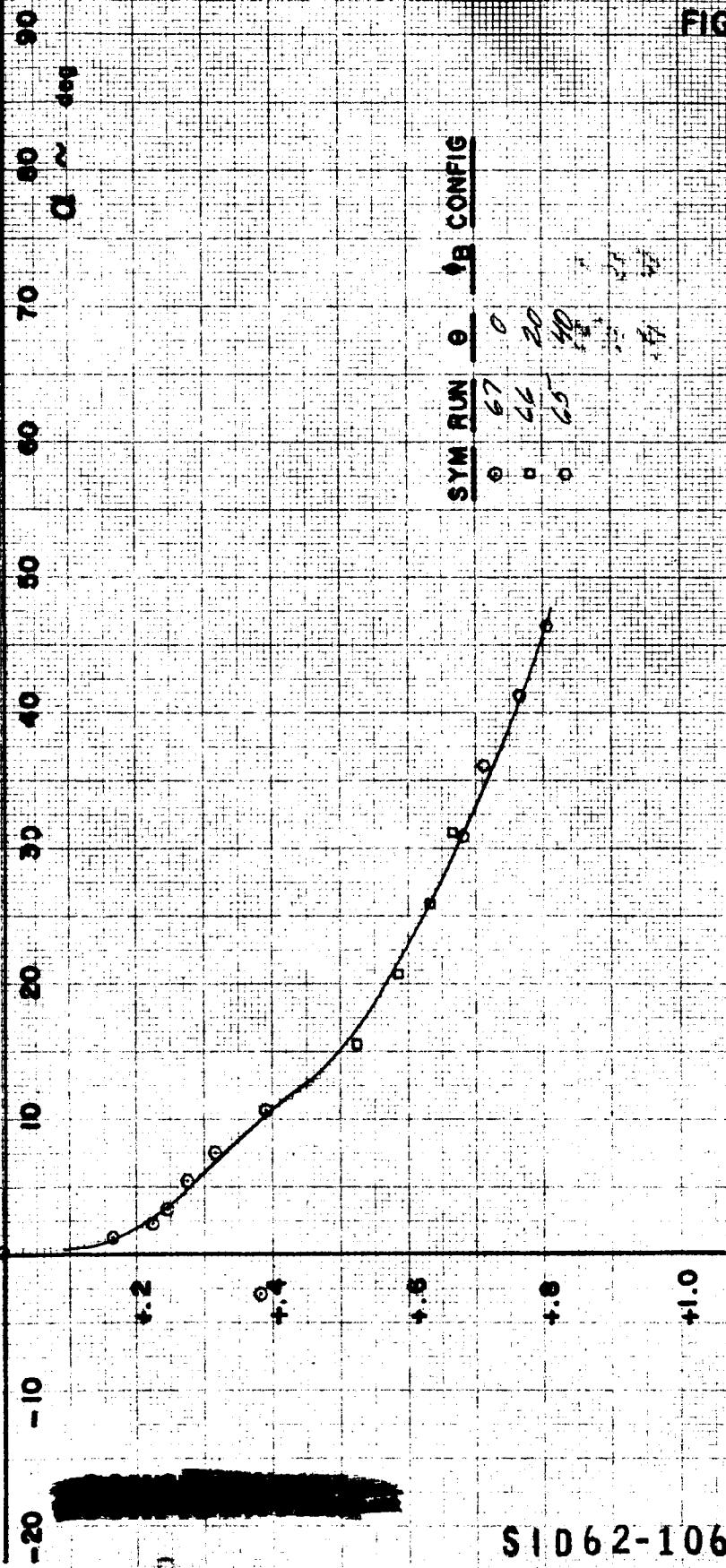
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FIG 10

LAUNCH ESCAPE SYSTEM - CHARGE SYSTEMS

 $\frac{XCP}{D}$ ENT C1225 PN - 324 *10³ TOWER
Mo. 225 $\frac{XCP}{D}$

-2



S1062-1063

XCP vs alpha

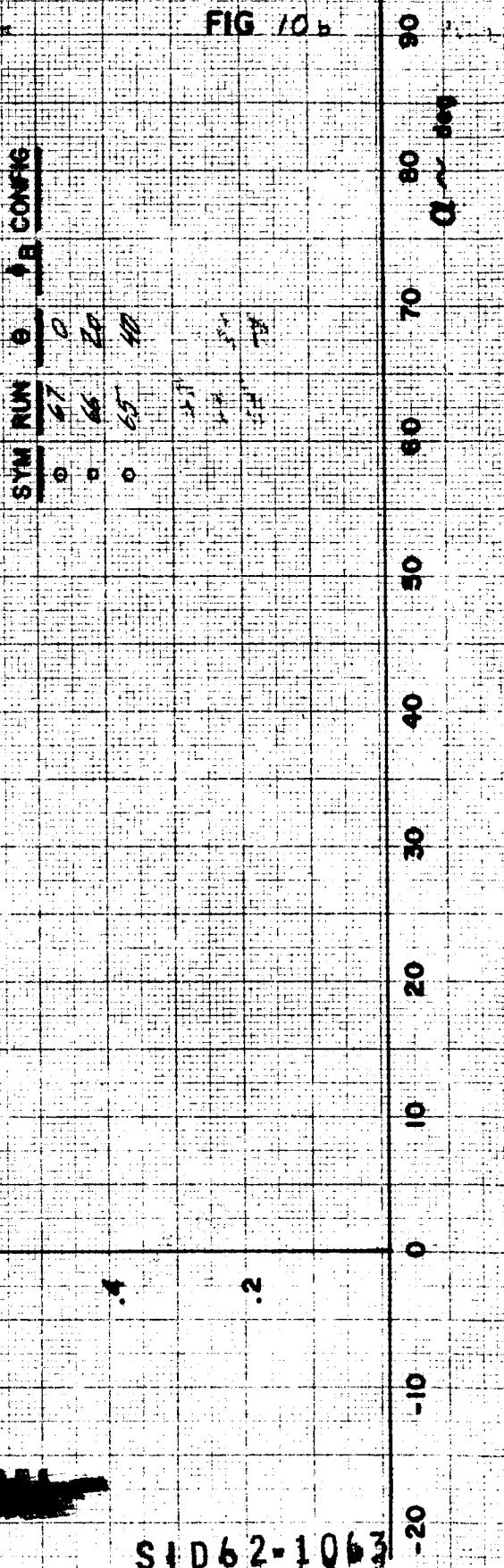
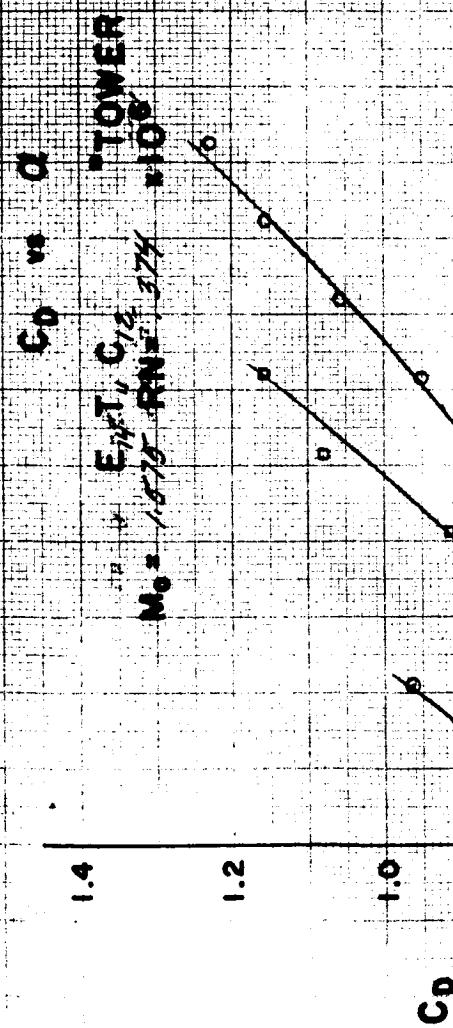
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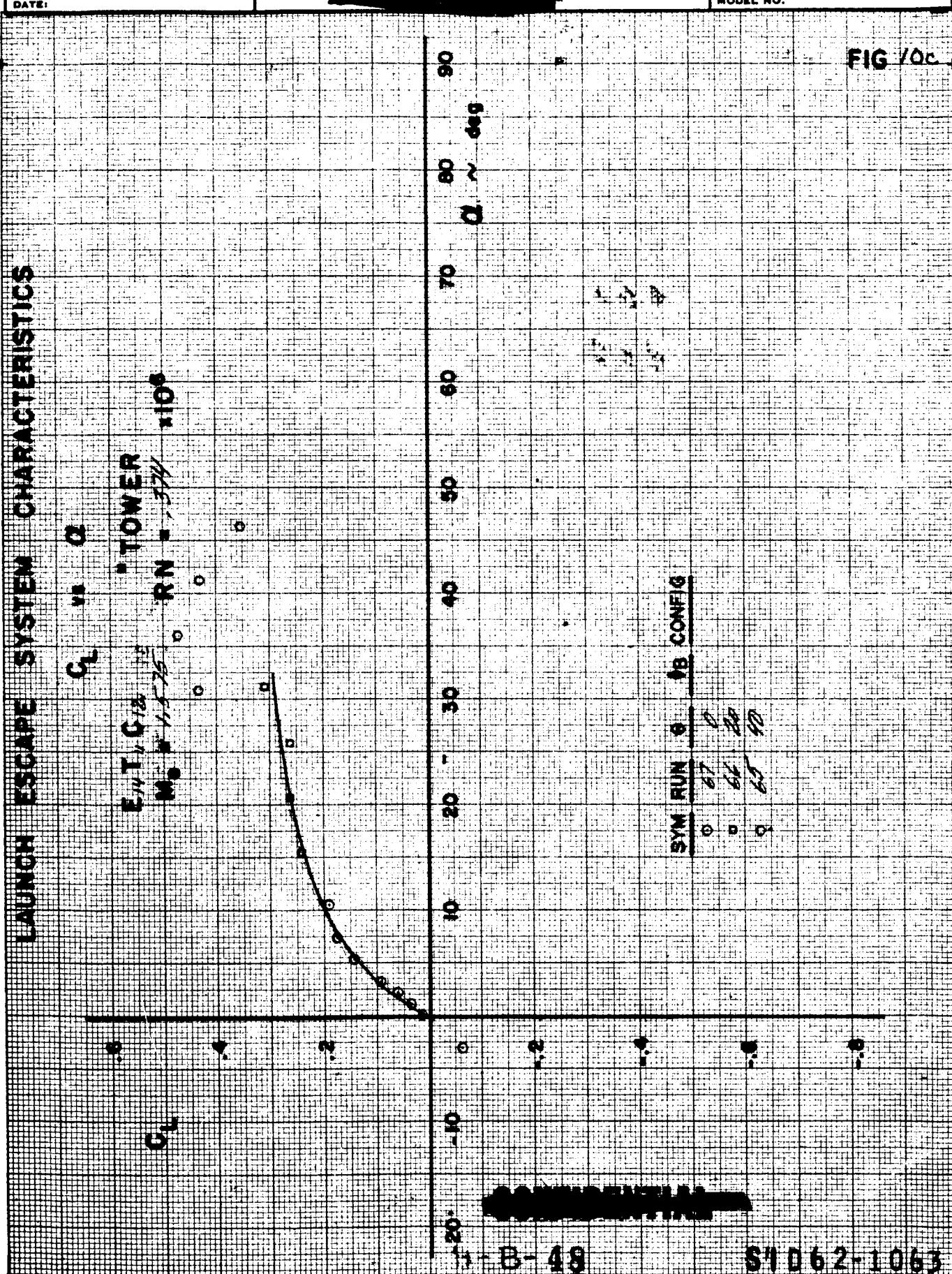
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LAUNCH ESCAPE SYSTEM CHARACTERISTICS



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FIG 10a

LAUNCH ESCAPE SYSTEM CHARACTERISTICS

C_N IN G'S AT 1/22 R/N = 32% V₀

SYM RUN # B CONFIG

67
66
65
64
63
62
61
6080
60
40
20
10
0
-10
-20

12

10

G

SID 62-1063

B - 50

C_N vs α

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LAUNCH ESCAPE SYSTEM CHARACTERISTICS

 C_{eq} vs α ET TOWER
M.O. = 115/5 RN = 377 10's

$$\frac{D}{D} = \frac{3}{3}$$

 C_{eq}

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

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22

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